PORTABLE TOWER TRAILER

Operations and Service Manual

WARNING!

READ AND UNDERSTAND MANUALS

You are responsible for the safe deployment, operation and maintenance of this equipment at all times.

DO NOT set this equipment near or around power lines or aircraft landing areas. Do Not attempt to erect tower in high winds, storms, or in the presence of lightning or soft soil conditions. Always guy tower according to operation manual. Do not over-tighten guy wires. Check guy tension after storms or high wind conditions. Never attempt to move while erected or damaged.

CHECK EVERY 30 DAYS: screw anchors, guy wires and hardware, jack post, outriggers, lift cables, foundation, grounding and corrosion. Perform all scheduled maintenance on a timely basis and report all issues immediately to proper parties including:

AirWay Technologies – (859) 689-0223

www.airway.com

All towers are tested by manufacturer prior to shipment. Call AirWay before deviating from the written procedures provided in this manual and prior to making any changes to unit. Any unauthorized modifications to the portable tower will void all warranties.

Deploying the Tower Safely

Deploying the tower is the most dangerous period during the use of a tower. Safety is the most important consideration during this period of time. Please read and understand all aspects of tower deployment before attempting to deploy the tower.

Tower Design

The portable tower is designed to carry a headload that is heavier than normal; however, it can be overloaded. Consult the load limits in this operation manual on page 4 to be sure you do not overload. Wind plays a large factor in the safety of deployment. Ensure that the wind speed is not in excess of 10 mph before and during deployment.

Site Conditions

Proper location of the tower trailer on site is the next important consideration for a safe tower deployment. The terrain on which the tower is to be deployed must be as level as possible, free from wet areas and overhead obstructions such as trees and power lines. The total area size for the trailer with outriggers extended is approximately 30 feet by 30 feet. If you are going to guy the tower the clear area should be 150 feet by 150 feet.

Avoid Tower Stress

The tower is designed to be able to stand up a maximum amount of weight as called for in the engineering specifications on page #4 DO NOT exceed recommended weight limits for any reason.

DO NOT CLIMB TOWER WITHOUT PROPER SAFETY EQUIPMENT! Tower shall be fully guyed with the base section locked out prior to any climbing, and lockout assemblies must be installed as the unit is climbed. See operating instructions for proper deployment of the unit.

Safety Equipment

The use of proper personnel safety equipment is essential while deploying the tower. The use of safety climbing gear, safety glasses, safety shoes, gloves, and hard hats is always recommended.

MAKE SAFETY YOUR NUMBER ONE CONCERN WITH THIS TOWER.

WHEN CONNECTING A POWER CABLE TO THE CONTROL BOX CABLE, ENSURE THAT THE CABLE IS AT LEAST 12/3 (12/4 FOR 220V SERVICE) OR LARGER GAUGE WIRE AND NO LONGER THAN 25'. A SMALL OR TOO-LONG POWER CABLE WILL NOT ALLOW ELECTRIC MOTORS TO OPERATE PROPERLY! PROVIDE A MINIMUM OF 20 AMP POWER SERVICE TO THE UNIT FOR 110V OPERATION, 20 AMP FOR 220V OPERATION.

Allowable Loading

The loading on the portable tower units must not exceed the following limitations. Failure to adhere to these requirements could result in malfunctioning of the unit and in extreme cases, property damage and personnel injury. All warranties are void if the tower loading limits are exceeded.

The maximum allowable loading for telescoping operation of the tower is 250 lbs. If any additional equipment is desired, the tower must be analyzed with the extra loading, and said equipment must be installed after tower has been fully extended (see "Electrical Operating Instructions" for further detail).

This tower unit has specifically been designed for only the appurtenance loading and wind speed specified in the tower drawing. The tower must not be overloaded!

ELECTRIC OPERATING INSTRUCTIONS

Check List

Before moving

1. Each outrigger must be locked in storage position.
2. Tower must be secured in place with tower pivot in full down position.
3. Connect safety turnbuckle tie down to tower (see figure #1).
4. Ensure the safety telescope lockout turnbuckle is attached (see figure #2).
5. Check cable for slack. Should have a slight amount.
6. Attach safety chain to tow vehicle (see figure #3).
7. Hook up trailer lights and brakes (see figure #4).
8. Check tower for any visible loose bolts or unsecured doors on the control box or toolbox.

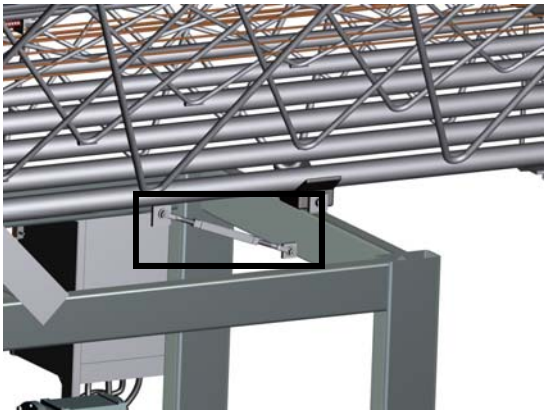


Figure #1

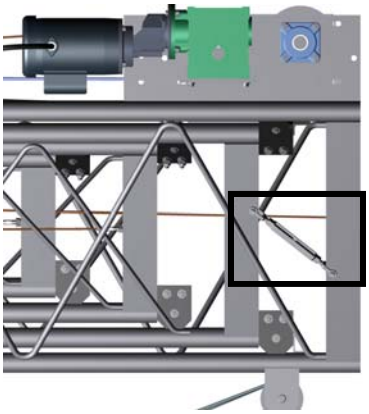


Figure #2

Figure #3

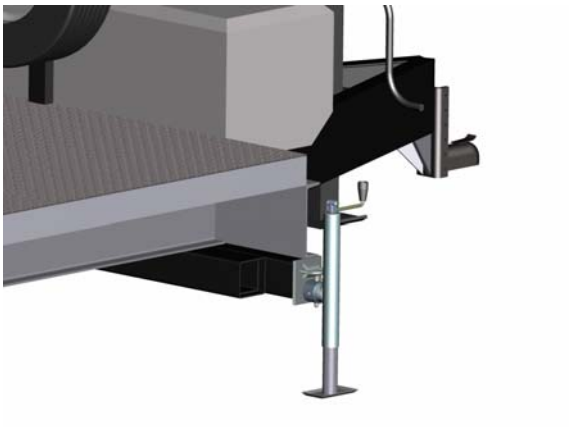
Figure #4

Before erecting tower

1. Check all the tower cables for frayed areas or where the cable might show excessive wear. DO NOT use tower with frayed cables.
2. Check for overhead obstructions—trees, highline wires, etc.
3. Check the local conditions and weather forecast for impending high winds. DO NOT erect the tower during periods with winds in excess of 10 mph.
4. Check soil conditions under the jackstands where the ground pads will sit.

Setup Procedure

1. Remove jackstands and pads from trailer.
2. Attach jackstands to outriggers (see figure #5).
3. Extend outriggers to fully locked position and lower until contact is made with the ground (see figure #6).
4. Level trailer to a horizontal plane by lowering the jackstands as needed, using leveling guides supplied in the toolbox.
5. Disconnect and remove safety turnbuckle tie down on tower section/tower mount frame (see figure #7).



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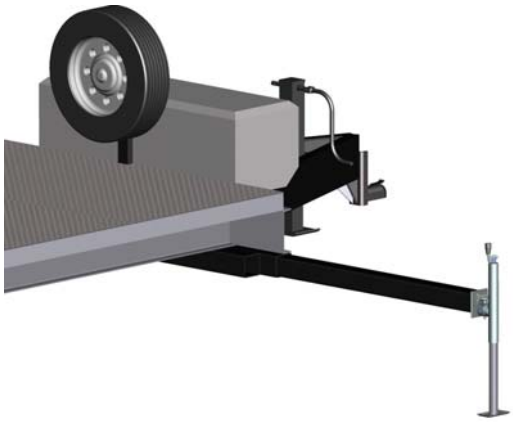


Figure #6

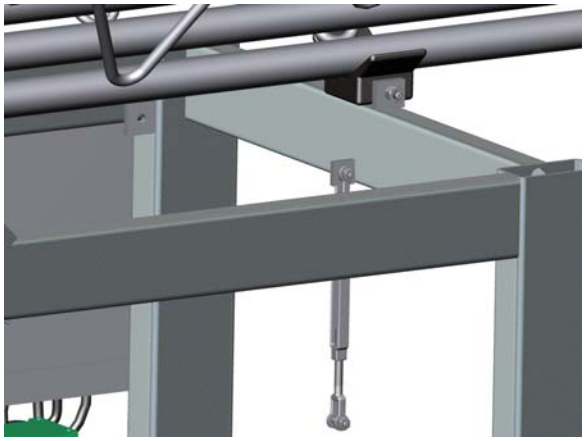


Figure #7

Tilting the tower vertical

1. Install and run any coax to the tower sections.
2. Connect control box to power supply. If 110V service is being supplied, the box labeled 220V need not be utilized and the power cord can be plugged in directly to the 110V cable (see figure #8). If 220V service is being supplied, connect the 220 supply to the 220 male plug, and connect the 110V male plug to the 220V female plug (see figure #9).
3. Power supply should be capable of providing 110V 20 amp power (if 220V, 20 amp power).
4. Cord used to power the unit should be no smaller than 12/3 cable, no longer than 25' for 110V. For 220V service, cord used should be 12/4 rated for 20 amp service, no longer than 25'.
5. Hold tilt switch in control box to up position until tower is completely vertical and comes into contact with securing tabs (see figure #10).
6. Watch for any overhead obstructions while tilting tower. Do not force tower. If motor appears to bind, let tower down and check for obstructions.
7. With tower vertical, bolt tower securing brackets to base tabs using supplied bolts and crescent wrench provided in tool box (see figure #11).
8. See troubleshooting guide on page 12 if problems arise.

Figure #8

Figure #9

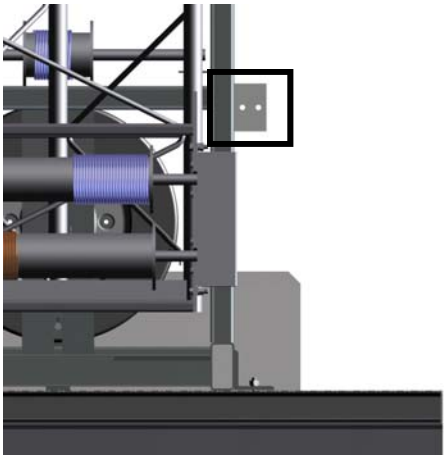


Figure #10

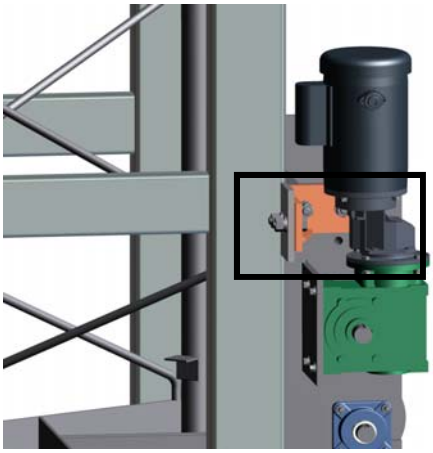


Figure #11

Extending the tower

1. Disconnect and remove telescope lockout kit between sections A & B (see figure #12).

2. Attach guying hardware to tower sections at appropriate positions (see figure #13). See guying drawing for details.

3. Spray the nylatron guides with supplied white lithium grease lubricant.

4. Hold erect switch to up position in control box until tower is extended to desired height. Limit switches will prevent tower from overextending, but watch to be sure limit switches function properly. If tower appears to bind, stop, let tower down slightly, and start again. If problems continue, check for obstructions. Call AirWay Technologies if issues persist.

5. With the tower fully extended, install the two safety lock out bolts in base section (see figure #14). To do this you must climb up to the top of the base section. Climbing rungs on the base section are provided to accomplish this. Proper climbing safety equipment is required. DO NOT CLIMB ABOVE BASE SECTION OF TOWER FOR ANY REASON WITHOUT LOCKOUT ASSEMBLIES ATTACHED.

6. To properly guy the tower, see guying drawing for details.

Figure #12

Figure #13

Figure #14

Locking the tower

1. Ensure the safety lock out bolts are in place, and local wind conditions are calm, less than 10 mph.
2. One section at a time, climb up to the top of the section and place the lockout assembly on each of the three section legs, ensuring the lockout angle bracket is resting underneath the leg of the next section (see figure #15). On the smaller sections, it may be easier to locate the lockout bracket at the top of the section, inverted (see figure #16). Bolts must be snug tight.
3. Repeat step 2 for each section.
4. Use appropriate safety climbing equipment at all times.

Figure #15

Figure #16

Retracting the tower

1. Climb to the top of the tower.
2. Remove the section lockout assembly. Climb down one section.
3. Repeat step 2 until you are at the base section.
4. Remove base section lock out bolts from top of base section.
5. Hold down the erection switch in control box and tower will retract to fully nested.
6. Watch cable on takeup drums of winch assembly. Assure that cable lines do not cross or become entangled while lowering.
7. Attach telescope lockout turnbuckle kit on sections A & B (see figure #17).

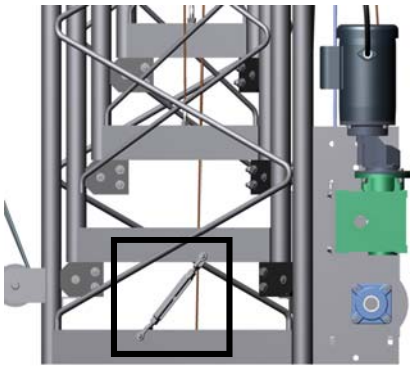


Figure #17

Tilting tower to horizontal

1. Remove base section securing bolts from bottom of base section with crescent wrench.
2. Hold down tilt switch in control box until tower is fully horizontal and full weight of tower is on rubber cushion on tower base.
3. Remove jackstands and retract outriggers. Replace all equipment in toolbox. DO NOT FORGET ANY BOLTS OR WRENCHES.
4. Remove guy wires and hardware. Store guy wires and hardware in toolbox.

GROUNDING

It is recommended that the tower, trailer and ground anchors be properly grounded for safe operation. Lack of proper grounding may cause damage to the unit and/or injury to persons within close proximity of the unit.

Adjusting the Pull-Down Cable Tension

Warning: This procedure can be dangerous if not performed properly. Carefully read all steps prior to any action, and call AirWay Technologies for guidance if necessary.

1. Do not attempt to adjust any cabling while the tower is erected. Ensure unit is in its vertical, nested position with lockout turnbuckle securely attached.
2. Using provided adjustable crescent wrenches, locate the gear box cover and remove the two bolts securing it to the motor mount plate.
3. Lock out the bottom drum by using a crescent wrench to prevent the keyed shaft from rotating. Caution, this can be difficult and dangerous if not locked out securely.
4. After the drum shaft is locked out, locate the chain connecting the two sprockets on the end of the shafts. Remove the chain by unhooking at the splice link (see figure #18). At this time, if the shaft is not locked out properly, it will rotate and cause the cables to become tangled. Do not allow the shaft to rotate uncontrollably.
5. Slowly allow the shaft to rotate until there is a slight amount of tension in the return cable (see figure #19). Visual observation of a properly tensioned cable should show the springs slightly compressed.
6. Once cable is tensioned properly, re-attach the chain, ensuring the splice link is securely fixed. At this point, the drum shaft should be locked out.
7. Remove the wrench used to lockout the drum and re-attach the gear box cover plate.

Figure #18

Figure #19

Maintenance Guideline

The following routine maintenance should be performed every 30 days or immediately after an extreme loading event:

- Check drive and guy cables for fraying/damage. Cables should be inspected monthly or more frequently depending on tower usage. It is recommended that the drive cables be replaced every three years – sooner if premature wear occurs.
- Check the tension in the cables. The lifting and lowering cables should be taut. Any adjustment to tension on any of the cables must be done when the tower is in its nested position.
- Cables should be kept lubricated with white lithium grease spray lubricant. Reapply monthly or more frequently, depending on usage.
- Any wear points that have galvanizing worn off must be properly cleaned and spray galvanizing applied to prevent damage.
- Check acetron guides for excessive wear/damage.
- Check motor drive shafts for corrosion/damage, apply grease.
- Check guy wire connections and re-tension as needed.
- Check bolt lockout, ensure tight connection.
- Lubricate nylatron sheaves, winch bearings and winch drive chain periodically to ensure proper operation.
- Check outriggers and jack stands, adjust as necessary.
- Check fluid levels of gearboxes. If low, add gear lubricant as required. See gearbox appendix for lubricant details.

Contact your supplier if replacement parts are required. Unit should be inspected immediately if subject to any unusual stresses to check for damage.

Troubleshooting Guide

If the trailer will not level:

If the local soils are too soft, the trailer will not level properly. Relocate the unit to firmer soils and level.

If the trailer is parked on a hill, the jacks will not be able to properly level the trailer as they are designed for minor grade changes. Relocate the trailer to flat ground for proper deployment.

If the tower will not tilt:

The limit switch may not be properly engaged. Check to see if the tower sections are nested enough to engage the lower limit switch (see figure #20). If the switch is not engaged, manually trip the limit switch.

The unit may have tripped the circuit breaker. Reset the main circuit breaker on the control panel.

The power supply may not be connected properly or is insufficient. Ensure the unit is plugged in and the source of power is functioning properly. Power supply must be connected to the unit using a 12/3 (12/4 for 220V) or larger gauge wire, and should not be longer than 25'. The power supply must be able to produce 20 amp power service for 110V operation, and 20 amp service for 220V operation.

There may be a cable failure. Check to see that all cables are intact, and all have a slight amount of tension. Any damaged or broken cables need to be replaced. Contact AirWay Technologies for additional support on replacing cables.

If tilt function cannot be restored with the above listed efforts, contact AirWay Technologies for additional assistance. Any changes made to the unit without approval from AirWay Technologies will void the warranty on the unit.

Figure #20

If the tower will not telescope:

The limit switch may not be properly engaged. Check to see if the tower sections are fully tilted, enough to engage the limit switch located on the tower mount frame (see figure #21). If the switch is not engaged, tilt the tower until the switch is engaged.

The pull-down cable may be too tight and prevent the tower sections from telescoping the full length. This will likely only occur when the tower is near fully deployed height. If this is the case, follow the written procedure for adjusting the pull-down cable listed on page #9 of this manual.

The unit may have tripped the circuit breaker. Reset the main circuit breaker on the control panel. If the problem persists, check for obstructions when the tower is moving. Additional white lithium grease spray may be required.

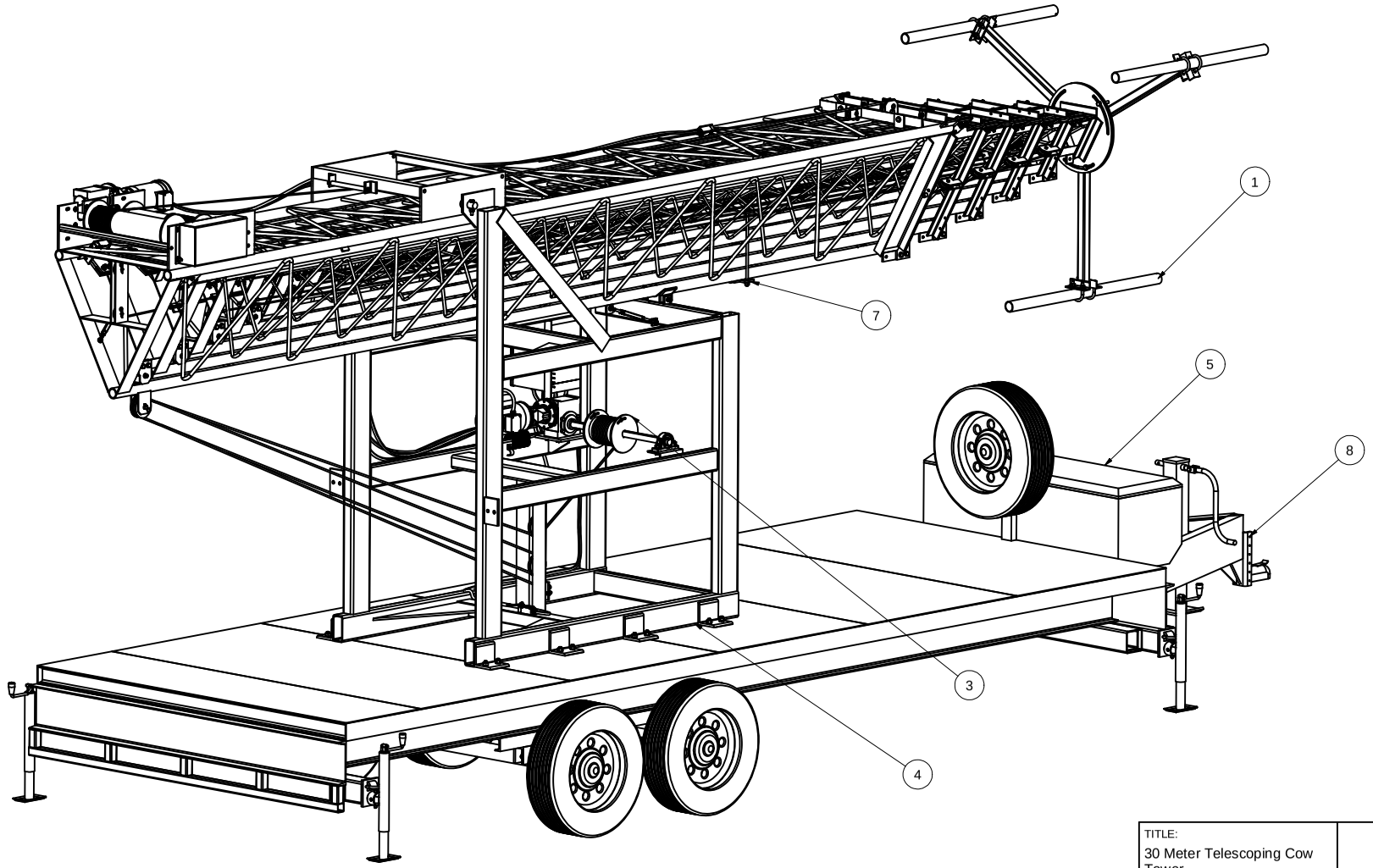
The power supply may not be connected properly or is insufficient. Ensure the unit is plugged in and the source of power is functioning properly. Power supply must be connected to the unit using a 12/3 (12/4 for 220V) or larger gauge wire, and should not be longer than 25'. The power supply must be able to produce 20 amp power service for 110V operation, and 20 amp service for 220V operation.

There may be a cable failure. Check to see that all cables are intact, and all have a slight amount of tension. Any damaged or broken cables need to be replaced. Contact AirWay Technologies for additional support on replacing cables.

If telescope function cannot be restored with the above listed efforts, contact AirWay Technologies for additional assistance. Any changes made to the unit without approval from AirWay Technologies will void the warranty on the unit.

Figure #21

BILL OF MATERIALS			
ITEM	QTY	DESCRIPTION	UNIT WEIGHT
1	1	Telescoping Tower, Antenna Mount Assembly	118 lbmass
2	1	30 Meter Telescoping Tower, Sections Assembly	3870 lbmass
3	1	30 Meter Telescoping Tower Pivot Assembly	209 lbmass
4	1	Telescoping Standard Tower Mount - Assembly	1274 lbmass
5	1	Telescoping Tower Standard Tool Kit	93 lbmass
6	1	Telescoping Tower 110v Electrical Assembly	73 lbmass
7	1	30 Meter Telescoping Tower, Telescoping Lock Assembly	7.3 lbmass
8	1	Cow Trailer Deck Over 8' Wide 22' Long Aluminum Decking (Galvanized)	4478 lbmass



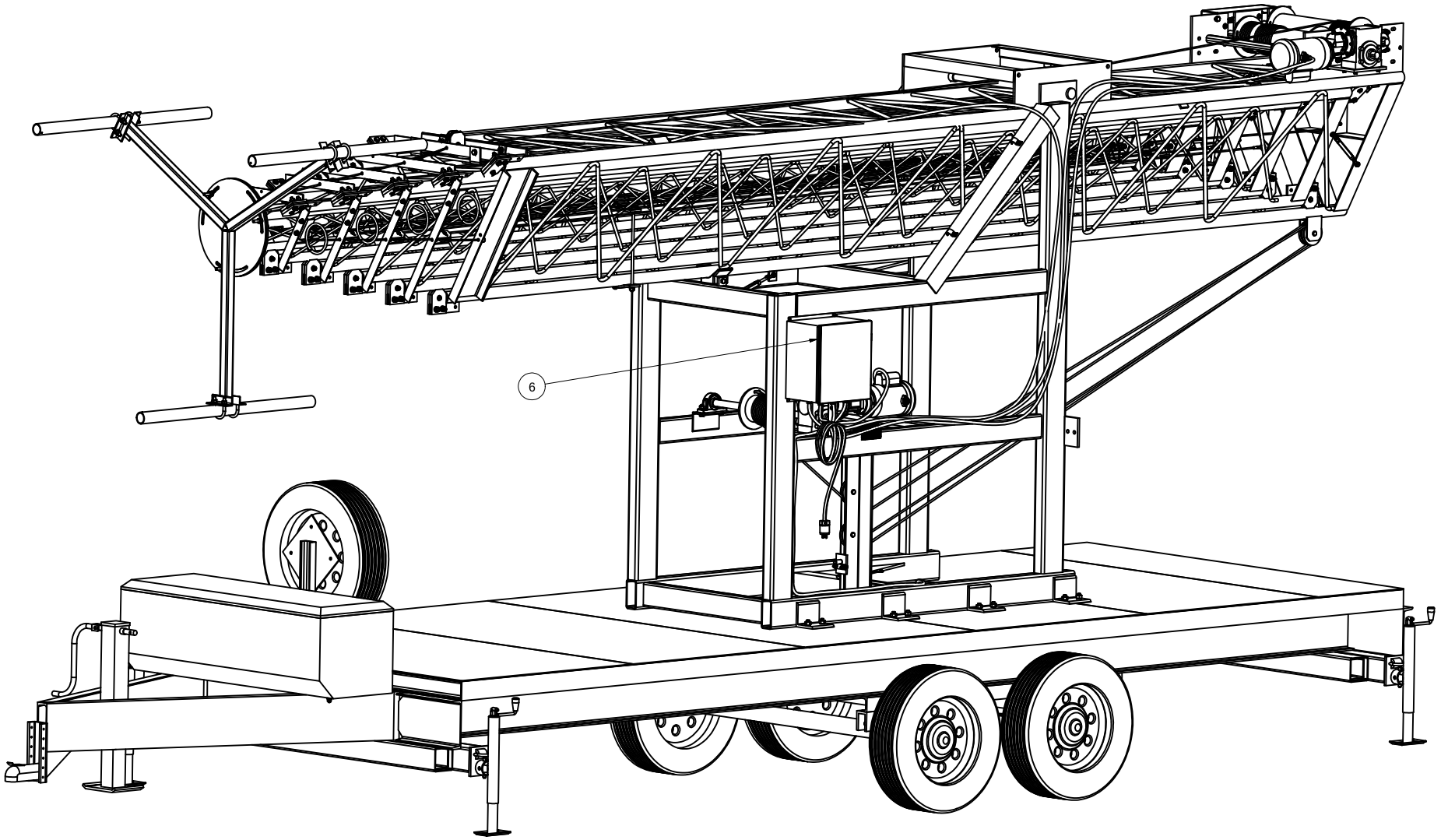
TOLERANCES:
Unless otherwise noted all dimensions must be to the following tolerances.
Fabrication +/- 0.06"
Machining +/- 0.01"

CAD APP: BG
MFG APP:
ENG APP: BG

TITLE:
30 Meter Telescoping Cow Tower

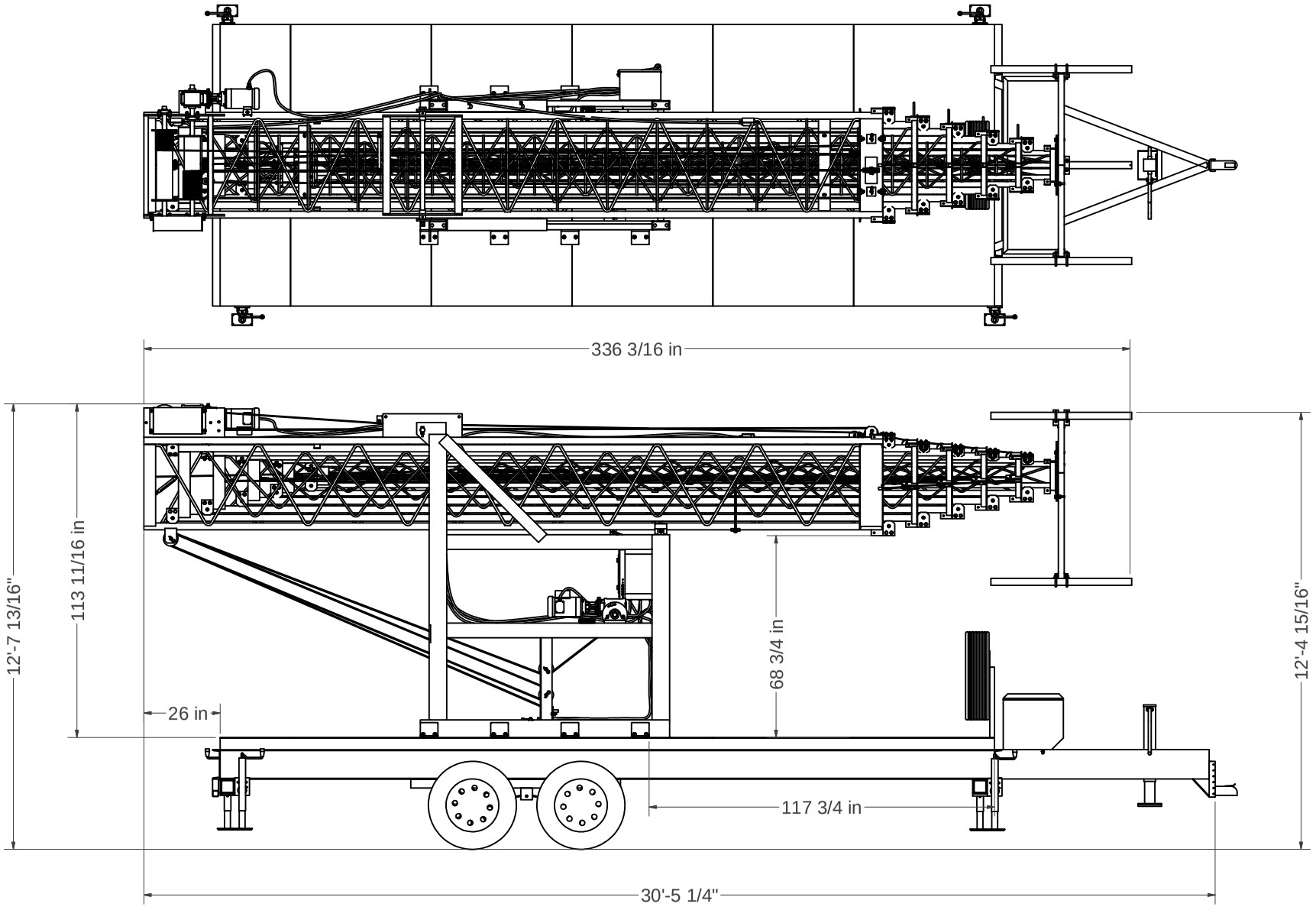
REV	BY	DATE	NPD	DESCRIPTION

DRAWN BY: TCT
NPD NO: 2292
ORIG. DATE: 1/29/2010
WEIGHT: 10123 lbmass
DWG NO: 127392
SHEET: 1 OF 3



TOLERANCES:	CAD APP: BG	TITLE: 30 Meter Telescoping Cow Tower	
Unless otherwise noted all dimensions must be to the following tolerances. Fabrication +/- 0.06" Machining +/- 0.01"	MFG APP:		
	ENG APP: BG		
	DRAWN BY: TCT	ORIG. DATE: 1/29/2010	DWG NO: 127392
	NPD NO: 2292	WEIGHT: 10123 lbmass	SHEET: 2 OF 3

REV	BY	DATE	NPD	DESCRIPTION



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Unless otherwise noted all dimensions must be to the following tolerances.
Fabrication +/- 0.06"
Machining +/- 0.01"

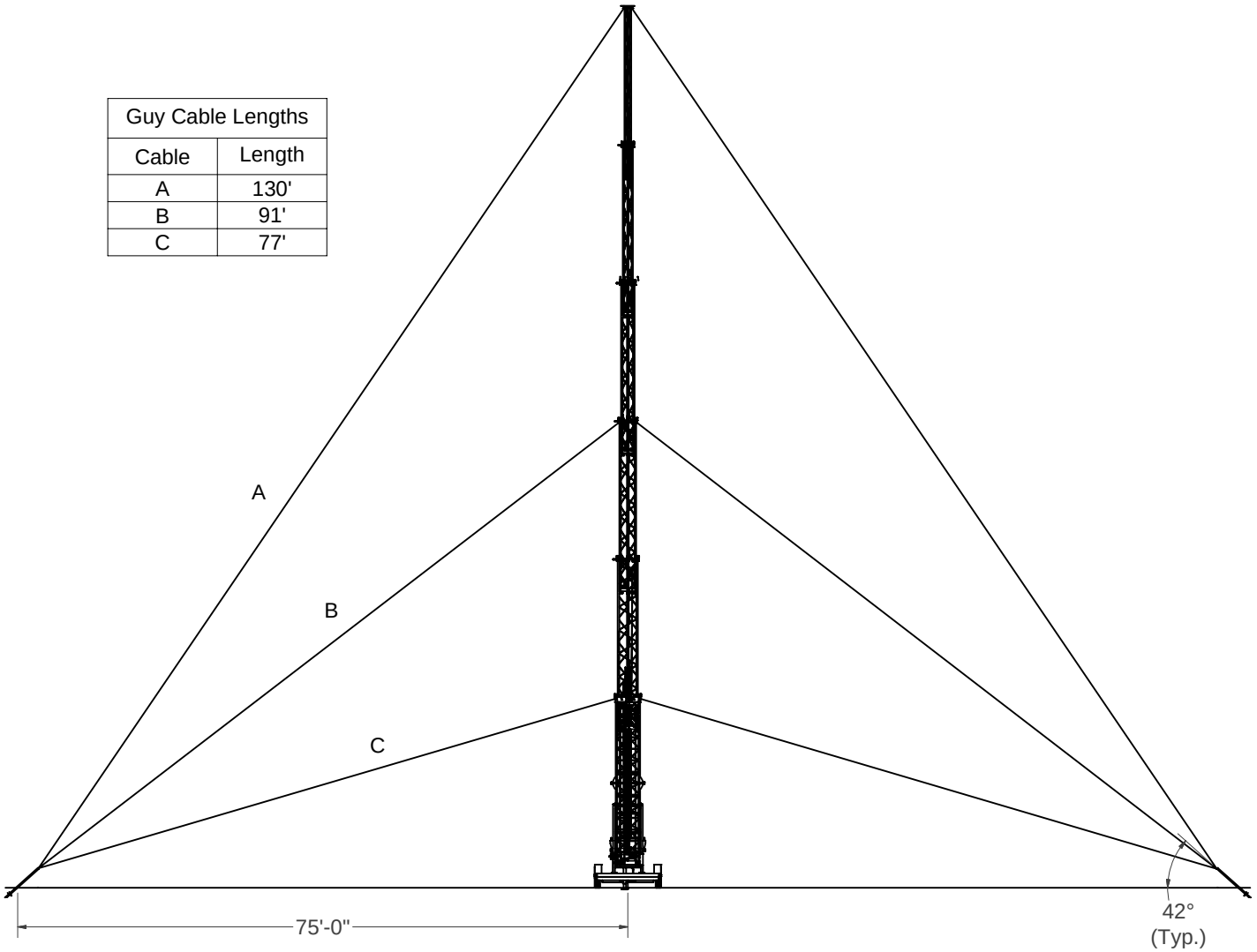
CAD APP: BG
MFG APP:
ENG APP: BG

TITLE:
30 Meter Telescoping Cow Tower

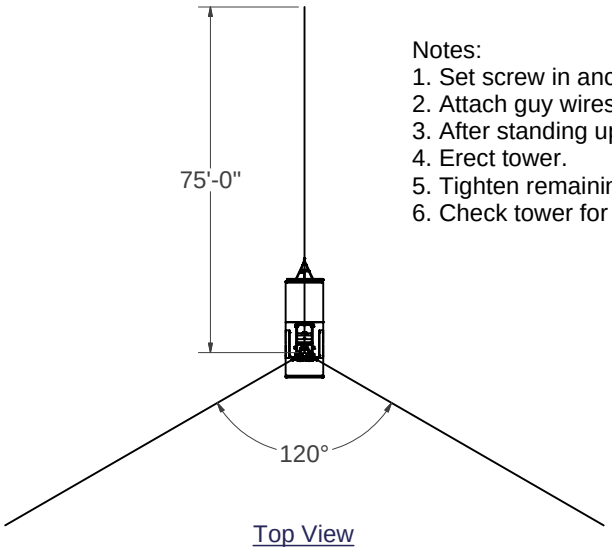
REV	BY	DATE	NPD	DESCRIPTION

DRAWN BY: TCT
NPD NO: 2292
ORIG. DATE: 1/29/2010
WEIGHT: 10123 lbmass
DWG NO: 127392
SHEET: 3 OF 3

Guy Cable Lengths	
Cable	Length
A	130'
B	91'
C	77'



106' Tower Guy Positions and Distances.
Screw in Anchors are Placed 75 Feet from Tower at 120° Apart.
Guy Kit Contains: 3-A Positions Wires. 3-B Positions Wires. and 3-C Positions Wires.



Top View

Notes:
1. Set screw in anchors as shown 75' from tower and at proper angle.
2. Attach guy wires to tower before standing upright
3. After standing upright, tighten guys on base section until tight.
4. Erect tower.
5. Tighten remaining guys in order around tower, snugging first, then tighten completely.
6. Check tower for plum and adjust if necessary.

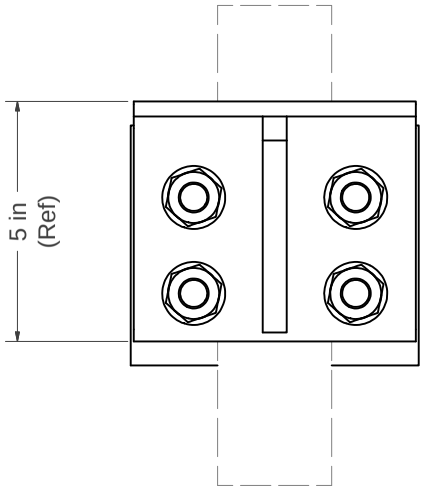
REV	BY	DATE	NPD	DESCRIPTION

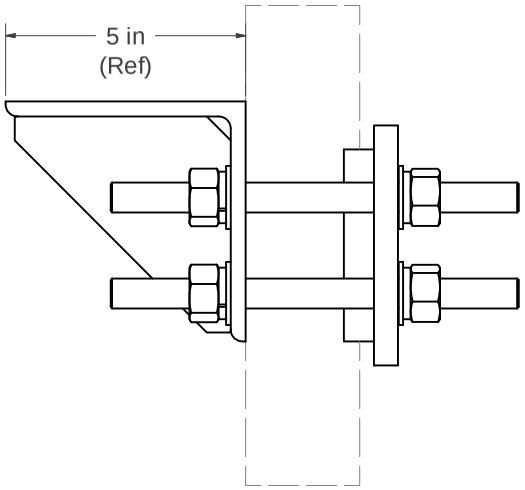
CAD APP:
MFG APP:
ENG APP:

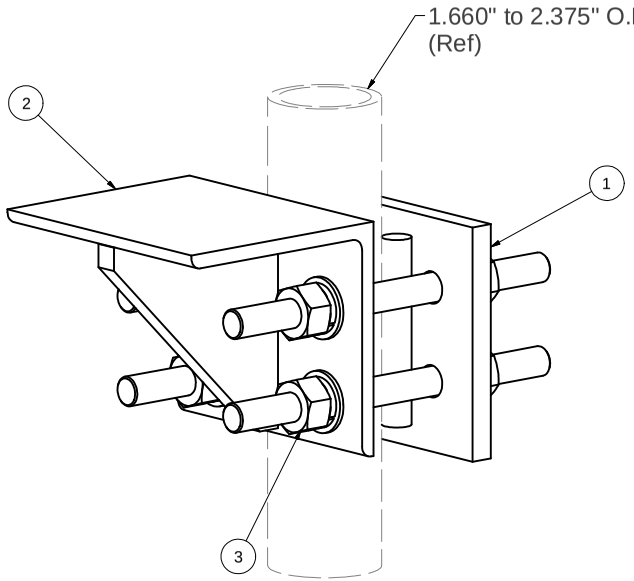
TITLE:
Cow Tower - Guy Cable
Illustration Drawing

DRAWN BY: TCT
ORIG. DATE: 11/12/2008
DWG NO: 118402
NPD NO: 1173
WEIGHT: N/A
SHEET: 1 OF 1

BILL OF MATERIALS			
ITEM	QTY	DESCRIPTION	UNIT WEIGHT
1	1	COW - Lockout Backing Plate Weldment	4.7 lbmass
2	1	COW - Lockout Weldment	6.6 lbmass
3	4	5/8"-11 x 8-3/8" Threaded Rod Kit - A449 - HDG	0.8 lbmass







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CAD APP: BRG
MFG APP:
ENG APP: BRG
DRAWN BY: DF
NPD NO: 3011

TITLE:
COW - Lockout Mounting Assembly

ORIG. DATE: 10/25/2011
WEIGHT: 19 lbmass
DWG NO: 158920
SHEET: 1 OF 1

REV	BY	DATE	NPD	DESCRIPTION
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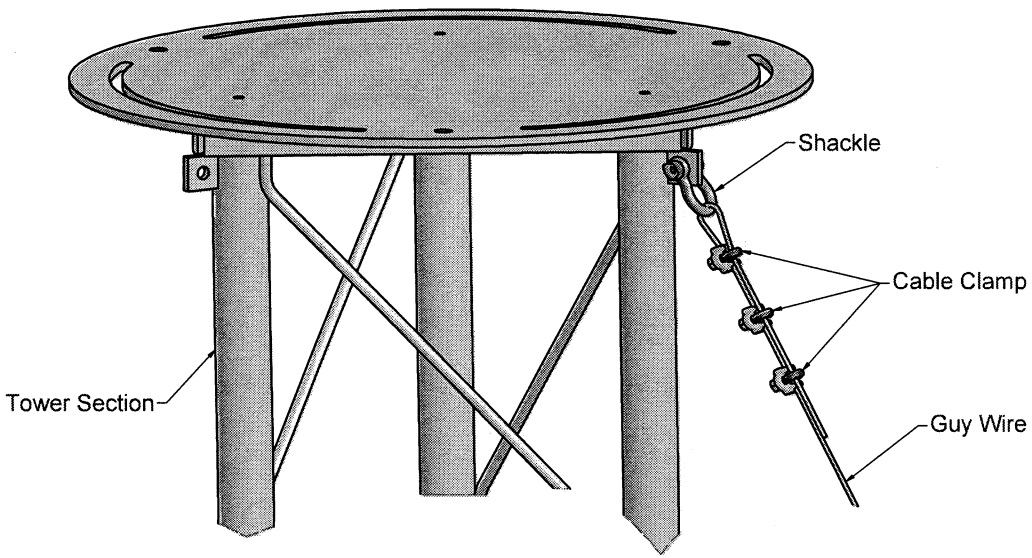

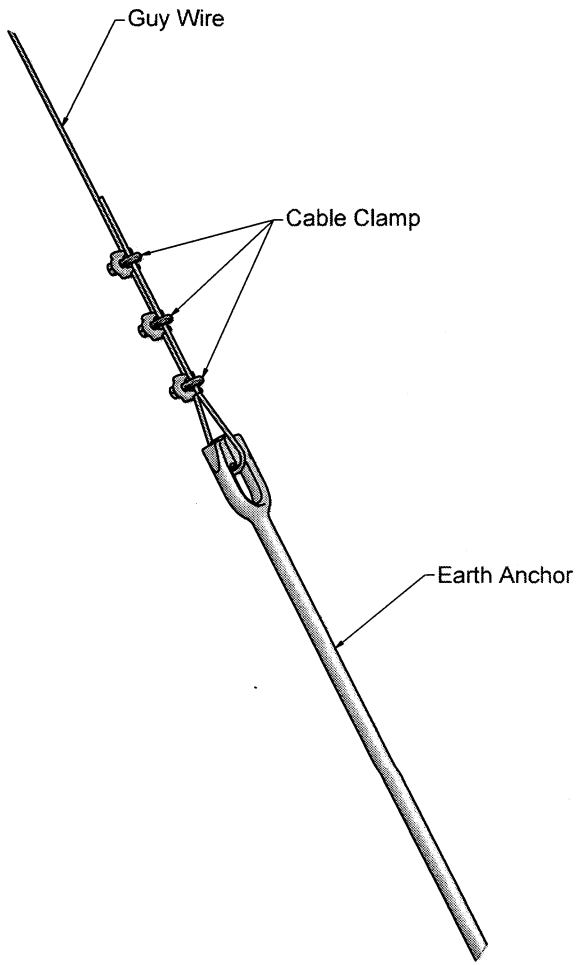

REV	BY	DATE	NPD	DESCRIPTION

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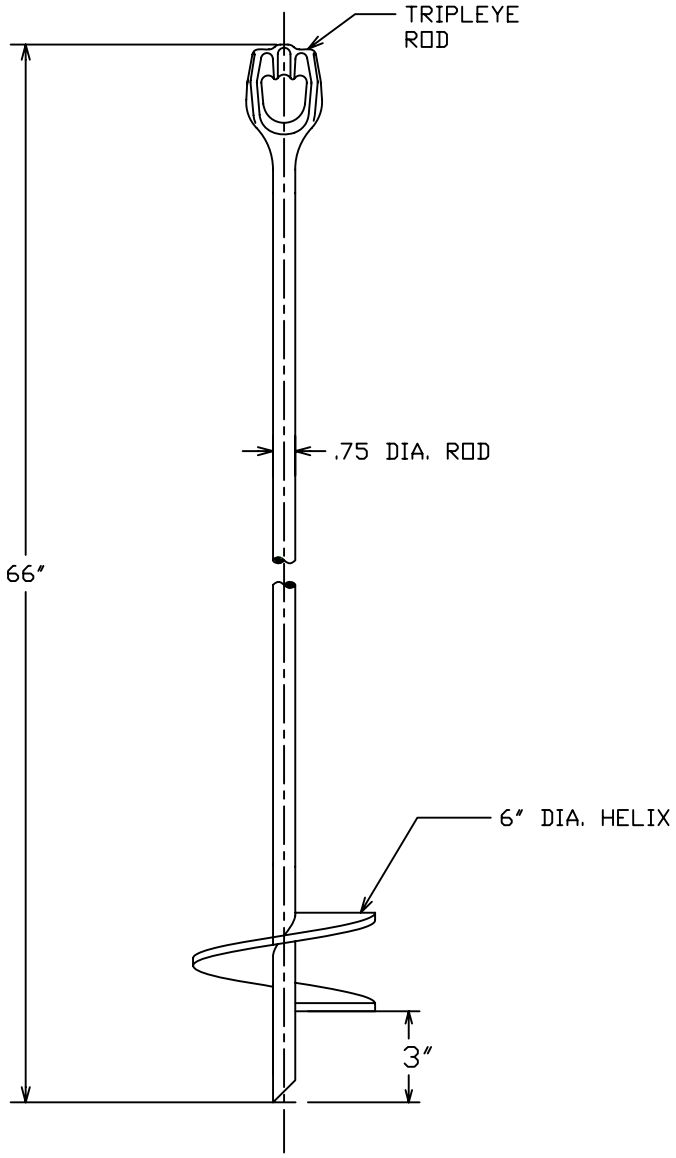
MFG APP:			
ENG APP: BG			
DRAWN BY: TCT	ORIG. DATE: 2/10/2010	DWG NO: N/A	
NPD NO: 2005	WEIGHT: N/A	SHEET: 1 OF 1	



-NOTES-

1. HOT DIP GALVANIZE PER ASTM A153 (LATEST REV.).
2. HOLDING STRENGTH VS CHANCE SOIL CLASS:
   CLASS 5 - 6,500 LBS
   CLASS 6 - 5,000 LBS
   CLASS 7 - 2,500 LBS
3. TYPICAL WORKING TORQUE FOR .75″ ROD IS 400 FT-LBS.

CHANCE® TOLERANCE CHART

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HUBBELL® POWER SYSTEMS

TITLE: NO WRENCH SCREW ANCHOR

SIZE	DWG NO.	CAT / PART / ASSY NO.	REV
B	SA6346	6346	--

DO NOT SCALE THIS DRAWING	DRN BY KSH	DATE 2/28/06	SHEET 1 OF 1

11

14

ANCHOR TOOLS

Warranty - Material

Hubbell Power Systems, Inc. warrants all products sold by it to be merchantable (as such term is defined in the Uniform Commercial Code) and to be free from defects in material and workmanship. Buyer must notify the Company promptly of any claim under this warranty. The Buyer's exclusive remedy for breach of this warranty shall be the repair or replacement, F.O.B. factory, at the Company's option, of any product defective under the warranty which is returned to the Company within one year from the date of shipment. NO OTHER WARRANTY, WHETHER EXPRESS OR ARISING BY OPERATION OF LAW, COURSE OF DEALING, USAGE OF TRADE OR OTHERWISE IMPLIED, SHALL EXIST IN CONNECTION WITH THE COMPANY'S PRODUCTS OR ANY SALE OR USE THEREOF. The Company shall in no event be liable for any loss of profits or any consequential or special damages incurred by Buyer. The Company's warranty shall run only to the first Buyer of a product from the Company, from the Company's distributor, or from an original equipment manufacturer reselling the Company's product, and is non-assignable and non-transferable and shall be of no force and effect if asserted by any person other than such first Buyer. This warranty applies only to the use of the product as intended by Seller and does not cover any misapplication or misuse of said product.

Warranty - Application

Hubbell Power Systems, Inc. does not warrant the accuracy of and results from product or system performance recommendations resulting from any engineering analysis or study. This applies regardless of whether a charge is made for the recommendation, or if it is provided free of charge.

Responsibility for selection of the proper product or application rests solely with the purchaser. In the event of errors or inaccuracies determined to be caused by Hubbell Power Systems, Inc., its liability will be limited to the re-performance of any such analysis or study.

NOTE: Because Hubbell has a policy of continuous product improvement, we reserve the right to change design and specifications without notice.

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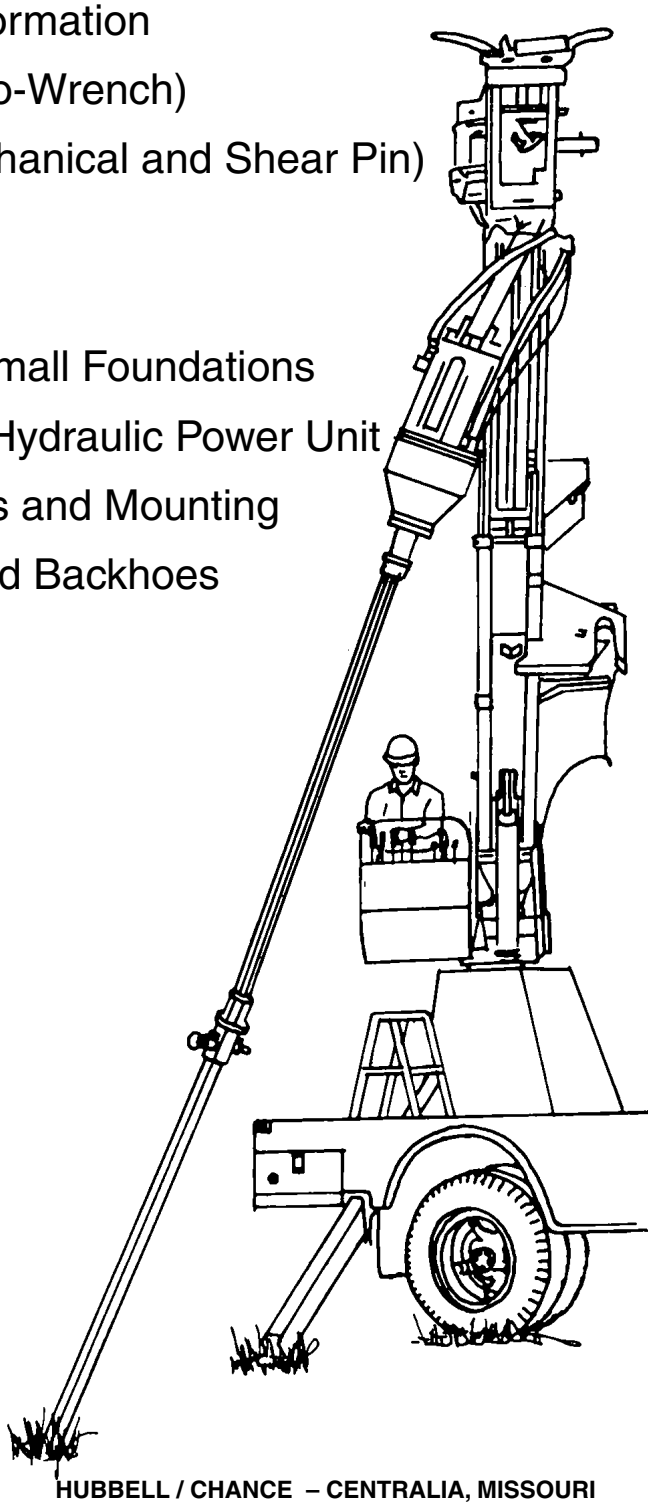


Installing Wrench Catalog Number	Length (ft.)	Maximum Installing Torque Rating (ft-lbs)	Outside Dim. (inches)	Inside Dim. (inches)	Orange	Yellow	Red
*C1021583	7'	10,000	2.16	1.46			
*C1021595	3½'	10,000	2.16	1.46			
*C3031064	7'	10,000	2.44	1.54		Yellow	
*C3031063	3½'	10,000	2.44	1.54		Yellow	
**C3030983	7'	15,000	2.44	1.54			Red
**C3030982	3½'	15,000	2.44	1.54			Red

*Fits Standard Locking Dog Assembly CC3030069HD
** Fits TOUGH ONE Locking Dog Assembly CC3030981

Inside and outside dimensions correspond to the color coded end of installing wrench.

Inside
Outside

PISA® 6 Anchor (formerly PISA® 5 Anchor)	PISA® 7 Anchor	Standard-Strength PISA® Anchor	Mid-Strength PISA® Anchor	C1025XX Series TOUGH ONE® Anchor - Small Hub	C1025XX Series TOUGH ONE® Anchor - Small Hub	C1025XX Series TOUGH ONE® Anchor - Large Hub	C1025XX Series TOUGH ONE® Anchor - Large Hub
		Orange	Orange	Orange	Orange		
		Orange	Orange	Orange	Orange		
Yellow	Yellow					Yellow	Yellow
Yellow	Yellow					Yellow	Yellow
Red	Red					Red	Red
Red	Red					Red	Red
6,000	**7,000**	**4,000**	**6,000**	**8,000**	**10,000**	**8,000**	**15,000**

Anchor Torque Rating (ft-lb)

HUBBELL POWER SYSTEMS, INC. CHANCE®

STANDARD and HYBRID PISA® Anchor Installing Tools

(For installing torques up to 10,000 ft.-lb.)

A complete tool system consists of: Kelly bar adapter, torque indicator, locking dog assembly and drive-end assembly. For instructions for selecting the proper Kelly bar adapter, see page 4A-5.

•Convertible to Extension Use

Extension assemblies can be added where soil conditions dictate that anchors be set more than one rod length deep or where digger to ground clearances are limited.

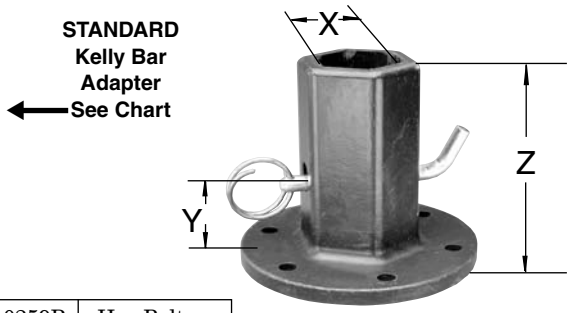
•Transmits Torque to Anchor Core

The wrench transmits the torque from the Kelly bar of the digger to the hub of the Power-Installed Screw Anchor so that the anchor rod need be only large enough in diameter to support the guy load.

STANDARD Kelly Bar Adapter with Bent Arm Pin (5¼" Bolt Circle)

Part No.	Kelly Bar Shape	Kelly Bar Dimension X	Y	Z	Wt. ea., lb.
630013	Hex	2"	5"	6⅛"	10
630011HD	Hex	2½"	4¼"	8⅛"	18
630012HD	Hex	2⅝"	4¼"	8⅛"	18
630014	Square	2¼"	2¼"	7"	13¼
630015	Square	2½"	2½"	7"	13¼

Each STANDARD Kelly bar adapter has six holes for ½" bolts on a 5¼" bolt circle and comes with six ½" Grade 5 bolts, nuts, lock washers and bent arm pin with coil lock.



P0010259P	Hex Bolt
055371P	Lockwasher
055635P	Hex Nut

STANDARD Locking Dog Assembly

Cat. No.	Description	Wt.ea.
C3030069HD	Complete STANDARD Locking Dog Assembly	20 lb.
C3030070	Locking Dog Replacement Kit includes parts needed to replace both locking dogs	4 lb.
P1300007P	Replacement Ring Only	0.10 lb.

STANDARD Locking Dog Assembly has six holes for ½" bolts on a 5¼" bolt circle, comes with six ½" Grade 5 bolts, nuts and lock washers.

7-ft. Drive-End Wrench

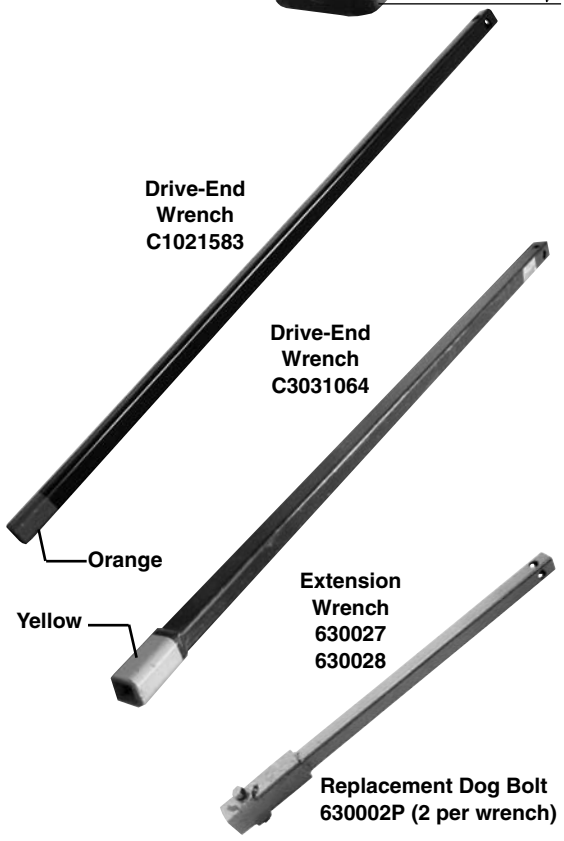
C1021583	STANDARD Drive-End Wrench installs 8,000 ft.-lb. (small hub) TOUGH ONE® anchors, 10,000 ft.-lb. (small hub) TOUGH ONE® anchors, 4,000 ft.-lb. Standard-Strength PISA anchors, 6,000 ft.-lb. Mid-Strength PISA anchors	57 lb.
†C3031064	HYBRID Drive-End Wrench installs 8,000 ft.-lb. (large hub) TOUGH ONE® anchors, 6,000 ft.-lb. PISA 6 anchors, 7,000 ft.-lb. PISA 7anchors	64 lb.

3½-ft. Drive-End Wrench

C1021595	STANDARD Drive-End Wrench installs 8,000 ft.-lb. (small hub) TOUGH ONE® anchors, 10,000 ft.-lb. (small hub) TOUGH ONE® anchors, 4,000 ft.-lb. Standard-Strength PISA anchors, 6,000 ft.-lb. Mid-Strength PISA anchors	29 lb.
†C3031063	HYBRID Drive-End Wrench installs 8,000 ft.-lb. (large hub) TOUGH ONE® anchors, 6,000 ft.-lb. PISA 6 anchors, 7,000 ft.-lb. PISA 7anchors	28 lb.

Extension Wrench for above STANDARD and HYBRID Drive-End Wrenches

630027	3½-ft. Extension	42 lb.
630028	7-ft. Extension	70 lb.



†NOTE: These wrenches will fit 15,000 ft.-lb. TOUGH ONE® anchors dimensionally, but . . . MUST NOT be used for TORQUES IN EXCESS of 10,000 ft.-lb.!

***NOTE: The old-style HYBRID wrenches C3031063 and C3031064, having a collar welded around the drive end, fit only PISA 6 and PISA 7 anchors.**

SCREW ANCHOR DRIVE TOOL STRINGS

(For installing torques up to 10,000 ft.-lb.)

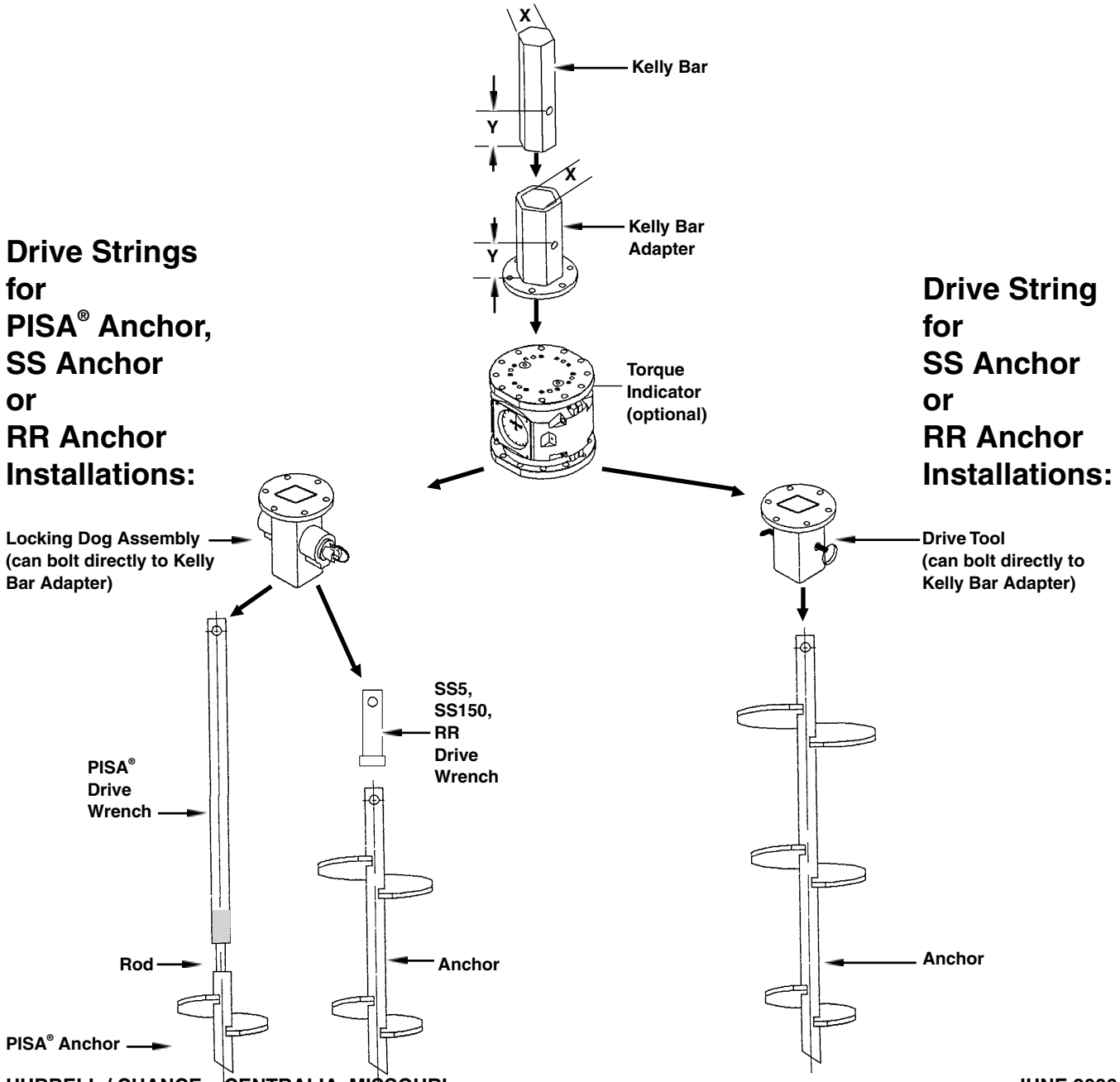
Selecting the correct Kelly Bar Adapter is key to building a successful Drive String. Follow these two easy steps:

1) Remove the auger from the digger and carefully measure the X and Y dimensions of the Kelly bar.
2) Match the shape of the Kelly bar and the X and Y dimensions with the Kelly bar adapter chart provided on page 4A-4 or 4A-6. The Y dimension on the Kelly bar adapter must be equal to or greater than the "Y" dimension on the Kelly bar itself.

A Note about Bolt Circles

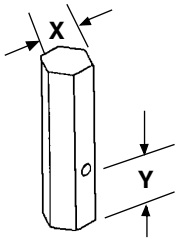
Chance anchor installing tools are provided with appropriate bolt circles for the expected service. The torque limitations for the three standard bolt circles are give below. **Never exceed the rated torque of any Chance installing tool.**

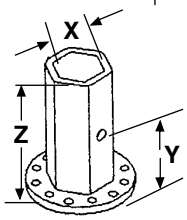
Bolt Circle	Use for Torque up to
(6) $^{1}/_{2}$" Grade 5 bolts on $5^{1}/_{4}$" Bolt Circle	10,000 ft.-lb.
(6) $^{5}/_{8}$" Grade 2 bolts on $7^{5}/_{8}$" Bolt Circle	15,000 ft.-lb.
(12) $^{5}/_{8}$" Grade 2 bolts on $7^{5}/_{8}$" Bolt Circle	20,000 ft.-lb.



TOUGH ONE® Anchor Installing Tools
(For installing torques up to 15,000 ft.-lb.)

A complete tool system consists of: Kelly bar adapter, torque indicator, locking dog assembly and drive-end assembly. For instructions for selecting the proper Kelly bar adapter, see page 4A-5.



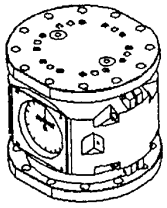


TOUGH ONE Kelly Bar Adapter with Bent Arm Pin (7⅝" Bolt Circle)

Part No.	Kelly Bar Shape	Kelly Bar Dimensions X	Y	Z	Weight, lb.	⅝" Gr. 2 Bolts Included	Bent Arm Pin Included
C3030936	Hex	2½"	3⅞"	8¼"	23	12	C3031223
C3030937	Hex	2⅝"	3⅞"	8¼"	23	12	C3031223
C3030940	Hex	3"	4½"	8"	27	12	C3031222
C3030955	Square	2½"	4¾"	7"	22	12	C3031227
C3030958	Square	3"	3½"&4 15/16"	7"	23	12	C3031227

Each TOUGH ONE® Kelly bar adapters has twelve holes for ⅝" bolts on a 7⅝" bolt circle, comes with twelve ⅝" Grade 2 bolts, nuts & lockwashers and bent arm pin with coil lock.

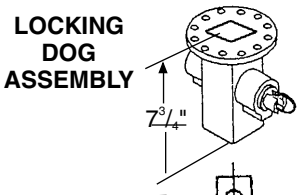
Hex Bolt	056653P
Lockwasher	055827P
Hex Nut	055803P



***Mechanical Torque Indicator**

Catalog No.	Description	Wt., lb.
C3031340	Torque Indicator adaptable to 5¼" B.C. or 7⅝" B.C.	65

*See page 4A-9 for additional information on Chance Torque Indicators.

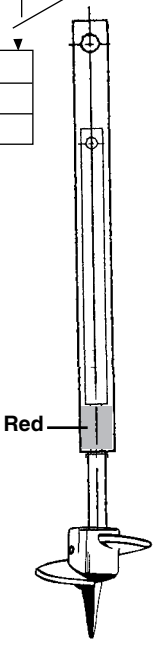


TOUGH ONE Locking Dog Assembly

Catalog No.	Description	Wt., lb.
C3030981	Complete TOUGH ONE Locking Dog Assembly	28
C3031026	Locking Dog Replacement Kit Includes all parts less casting	5

TOUGH ONE locking dog assembly has twelve holes for ⅝" bolts on a 7⅝" bolt circle and comes with twelve ⅝" Grade 2 bolts, nuts and lockwashers.

Hex Bolt	056653P
Lockwasher	055827P
Hex Nut	450314P



TOUGH ONE Drive-End Wrenches

Catalog No.	Length	Description	Wt., lb.
C3030982	3½ ft.	Installs 15,000 ft.-lb. (large hub) TOUGH ONE®	36
C3030983	7 ft.	Anchors, 8,000 ft.-lb. (large hub) TOUGH ONE® and all 1½" Core Anchors	73

TOUGH ONE® drive ends are painted with a red band on the bottom.

Extension Assemblies for TOUGH ONE Drive-End Wrench

Catalog No.	Length	Description	Wt., lb.
C3030987	3½ ft.	Extension attaches to drive-end wrench when additional depth is required.	53
C3030988	7 ft.		89

See page 4A-8 for SS and RR Anchor Tool options when using the TOUGH ONE® Drive String System.

ANCHOR INSTALLING TOOL
BENT ARM PIN WITH COIL LOCK

Use with STANDARD and TOUGH ONE® Kelly bar adapters, SS, RR and bumper post installing tools

Each Chance plated-steel Bent Arm pin is designed to attach a Kelly bar adapter to a Kelly bar. Also used to secure SS, RR and bumper post anchors to anchor drive tools.

Bent Arm Pins with Coil Locks are included with new tools as required. Order Pins and Coil Locks for existing tools as shown below.

WARNING
DANGEROUS STORED ENERGY. CAN CAUSE SERIOUS INJURY OR DEATH. DO NOT EXCEED 10,000 FT. LBS. OF TORQUE.
SEE INSTRUCTION SHEET.
P303-1084

ORDERING INFORMATION

Kelly Bar Adapter	Bent Arm Pin and Coil Lock Assembly
*630010	C3031227
*630011	C3031223
630011HD	C3031223
*630012	C3031223
630012HD	C3031223
630013	C3031223
630013A	C3031223
630014	C3031222
630015	C3031222
630016	C3031227
630017	C3031227
C3030936	C3031223
C3030937	C3031223
C3030940	C3031222
C3030955	C3031227
C3030958	C3031227

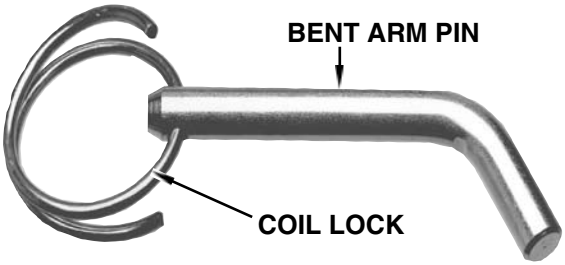
*Old-style Kelly Bar Adapters, no longer available.

SS/RR Tools	Bent Arm Pin and Coil Lock Assembly
639001	C3031226
C3030195	C3031225
C3030201	C3031224
C3030202	C3031224
C3030020	C3031226

Bumper Post Tools	Bent Arm Pin and Coil Lock Assembly
C3030737	C3031227
C3030739	C3031227

⚠ WARNING

Chance Bent Arm Pins with Coil Locks are the only tested and approved means for through-pin attachment of drive tools. Do not attempt to use any other means of attachment.



To order Coil Lock only, order Part No. P3031215.

Bent Arm Pin and Coil Lock Assembly	Size
C3031226	3" x 5/8"
C3031225	3 1/2" x 3/4"
C3031224	4 1/2" x 1"
C3031227	5" x 3/4"
C3031223	4 1/2" x 1/2"
C3031222	5" x 5/8"

⚠ WARNING

Always use the approved combination of Coil Locks and Bent Arm Pins. Never attempt to use any other combinations, such as hair pins, cotter keys, etc., with Bent Arm Pins.

ADAPTERS

C3030115

T3030166

BOLT CIRCLE ADAPTERS
(For torques up to 10,000 ft.-lb.)

These adapters are used to connect two tools having incompatable bolt circles. The C3030115 is for use between two tools having tapped 5 1/4" bolt circles.

The T3030166 is for use between a tool having a 5 1/4" bolt circle and one having a 7 5/8" bolt circle.

Both are limited to 10,000 ft.-lb.

Cat. No.	Description	Wt., lb.
C3030115	Bolt circle adapter with two 1/2" x 5 1/4" bolt circles	11
T3030166	Bolt circle adapter with one 1/2" x 5 1/4" bolt circle and one 5/8" x 7 5/8" bolt circle	18

639001

FOR INSTALLING SS OR RR ANCHORS

These Drive tools require the appropriate Kelly bar adapter, sold separately. Each comes with bolts, nuts and lockwashers.

Cat. No.	Description	Bolt Circle	Approx. Wt., lb.
639001	SS5/SS150/RR Drive Tool	(6) 1/2" holes on 5 1/4" B.C.	7
C3030195*	SS175 Drive Tool	(12) 5/8" holes on 7 5/8" B.C.	18
C3030201*	SS200 Drive Tool	(12) 5/8" holes on 7 5/8" B.C.	30
C3030202*	SS225 Drive Tool	(12) 5/8" holes on 7 5/8" B.C.	30

*Requires use of T3030166 adapter, and limited to 10,000 ft.-lb., when used with STANDARD Kelly bar adapter (with a 5 1/4" bolt circle).

C3030020

Cat. No.	Description	Unit fits:	Approx. Wt., lb.
C3030020	SS5/SS150/RR Drive Tool	STANDARD Locking Dog Assembly	8
C3031035		TOUGH ONE® Locking Dog Assembly	11
T3031403	SS175 Drive Tool	TOUGH ONE® Locking Dog Assembly	26
C3031077	SS200 Drive Tool		23

These tools slide into locking dog adapter and are retained by spring loaded dogs.

E3030255

FOR INSTALLING NO-WRENCH ANCHOR & MANUAL FOUNDATION TOOL

Especially designed for use with the Chance portable anchor installer. This tool bolts directly to the installer's output flange or Kelly bar adapter having six 1/2" dia. holes on a 5 1/4" bolt circle. Adjustable pivoting plates accept rods from 3/4" to 1 1/4" diameter.

For manually-installed foundations, eyenut must be temporarily installed for installation. Has four holes on 5 1/4" bolt circle for attachment. Includes four 1/2" x 1 1/2" bolts, nuts and lockwashers.

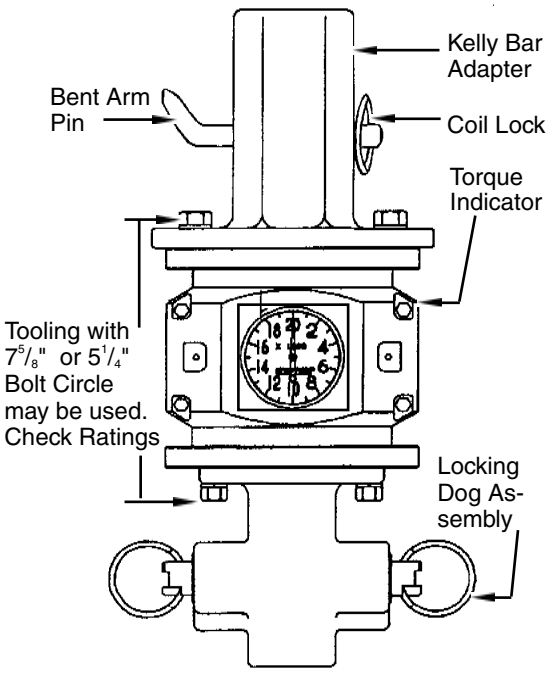
Cat. No.	Weight, lb.
E3030255	9

CHANCE TORQUE INDICATORS

Using the Chance Torque Indicator, you can install screw anchors to a pre-determined torque value which gives a positive indication of anchor holding capacity in any type soil. These tools also help your crew avoid excessive torsional loading which could cause damage to the anchor and/or other anchor tools during installation.

The Indicators are mounted between the Kelly bar adapter and drive wrench or locking dog assembly.

MECHANICAL TORQUE INDICATOR C3031340
(For Installing torques up to 20,000 ft.-lb.)


Kelly Bar Adapter
Bent Arm Pin
Coil Lock
Torque Indicator
Tooling with 7⅝" or 5¼" Bolt Circle may be used. Check Ratings
Locking Dog Assembly

Offers: Easy-to-read dial gives the operator a direct readout of installation torque at all times.

No Shear pins to replace.

Top and bottom each has six holes tapped ½" - 13 on a 5¼" bolt circle and twelve holes tapped ⅝" - 11 on a 7⅝" bolt circle.

NOTE: Mechanical Torque Indicator is not recommended in heavy, rocky soil applications.

SHEAR PIN TORQUE LIMITER C3030044
(For Installing torques up to 10,000 ft.-lb.)

Offers: Protection for anchors and installing tools by disconnecting the power when the installing torque reaches a preselected level.

Useable in very rocky soil.

Durable — does not require special storage or handling.

Top and bottom each has six holes tapped ½" - 13 on a 5¼" bolt circle.

Catalog Number	Description	Wt., lb.
C3030044	Shear Pin Torque Indicator	54
*C3030045	One Carton of Shear Pins (Approx. 1700 pins)	50
*T3031420	One Box of Shear Pins (Approx. 510 pins)	15

*Each Shear Pin provides 500 ft.-lb. of torque.

SOIL TEST PROBE

•Determine soil conditions without taking core samples

The Chance Soil Test Probe is a mechanical instrument which enables the operator to determine the condition of the sub-soil without core samples. A ratchet-handle torque wrench which slides up and down on the shaft is used to install or retract the probe. Torque wrench readings, in inch-pounds, provide a way to measure the consistency of the sub-soil. The torque values obtained are translated into soil classifications using the copyrighted Chance Soil Classification Table (see below) located on the inside flap of the carrying case.

Torque readings are taken at the depth to which an anchor is to be installed, and at least 2 feet above this depth because the average earth consistency 2 to 3 feet above the anchor determines the anchor holding capacity. The probe shaft is marked at 1-foot intervals permitting soil evaluation at every foot of depth.

The length of the Soil Test Probe (including helix) is 5 feet. Each shaft coupled to the probe provides an additional 5 feet. A durable carrying case protects the equipment when not in use.

ORDERING INFORMATION

Soil Test Probe 1800 in.-lb. Capacity

Cat. No.	Description	Length	Weight
C3090032	Probe w/3 5-ft. extensions	20'	21 1/2 lb.

Accessories

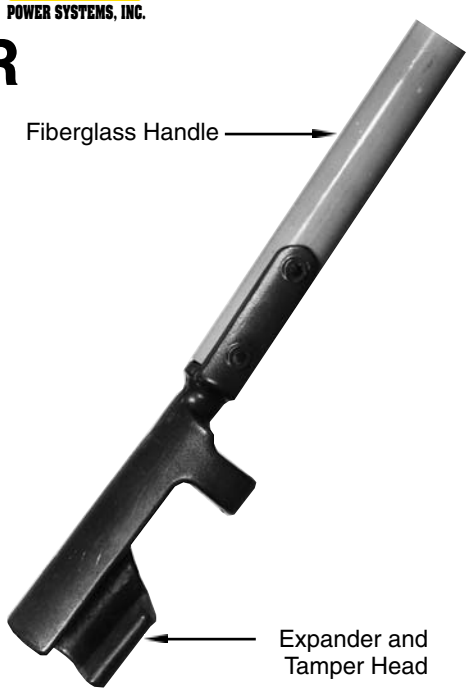
Catalog No.	Description	Weight
C3090033	5-ft. extension only	3 lb.

SOIL CLASSIFICATION DATA

Class	Common Soil-Type Description	Geological Soil Classification	Probe Values ft.-lb. (NM)	Typical Blow Count "N" per ASTM-D1586
N.A.	Sound hard rock, unweathered (bedrock)	Granite, Basalt, Massive Limestone	N.A.	N.A.
1	Very dense and/or cemented sands; coarse gravel and cobbles	Caliche, (Nitrate-bearing gravel/rock),	over 60 (85 - 181)	60-100+
2	Dense fine sands; very hard silts and clays (may be preloaded)	Basal till; boulder clay; caliche; weathered laminated rock	over 50 (68 - 85)	45-60
3	Dense sands and gravel; hard silts and clays	Glacial till; weathered shales, schist, gneiss and siltstone	42 - 50 56 - 68	35-50
4	Medium dense sand and gravel; very stiff to hard silts and clays	Glacial till; hardpan; marls	33 - 42 (45 - 56)	24-40
5	Medium dense coarse sands and sandy gravels; stiff to very stiff silts and clays	Saprolites, residual soils	25 - 33 (34 - 45)	14-25
6	Loose to medium dense fine to coarse sands to stiff clays and silts	Dense hydraulic fill; compacted fill; residual soils	17 - 25 (23 - 34)	7-14
**7	Loose fine sands; Alluvium; loess; medium - stiff and varied clays; fill	Flood plain soils; lake clays; adobe; gumbo, fill	8 - 17 (11 - 23)	4-8
**8	Peat, organic silts; inundated silts, fly ash very loose sands, very soft to soft clays	Miscellaneous fill, swamp marsh	under 8 (0 - 11)	0-5

Class 1 soils are difficult to probe consistently and the ASTM blow count may be of questionable value.
**It is advisable to install anchors deep enough, by the use of extensions, to penetrate a Class 5 or 6, underlying the Class 7 or 8 Soils.

EXPANDING & TAMPING BAR



The Chance fiberglass handle Expanding and Tamping Bar simplifies the job of expanding anchors. The curved Expander and Tamper Head distributes the weight of the bar evenly around the anchor rod to reduce handle vibration. The hook of the Expanding and Tamping Bar wraps around the anchor rod to keep the expanding head from slipping off the anchor top plate. This tool is also effectively used for tamping in soil above the installed anchor. The base casting is attached directly to the fiberglass handle.

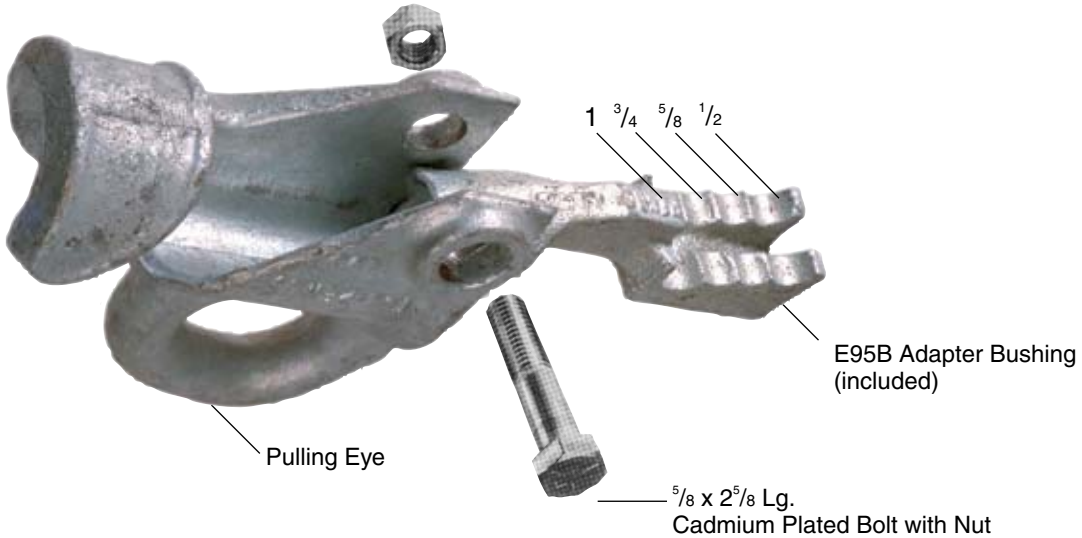
Cat. No.	Description	Length	Weight
C3020003	Expanding & Tamping Bar	10'	22 lb.
C3020004	Expanding & Tamping Bar	12'	24 lb.
*E3020001	Fiberglass Handle	10'	7 lb.
*E3020006	Fiberglass Handle	12'	8 lb.
P3020002	Expander and Tamper Head	N/A	14 lb.

*Includes plug mix to reset handle.

STANDARD PULLING EYE

This inexpensive cost-cutter provides a large offset eye to accommodate three-ton chain hoist hooks, and leaves the anchor eye free with plenty of clearances for attaching formed wire grips. By removing the Adapter Bushing, the E96 Pulling Eye fits 1¼" rods. The E96 Pulling Eye is inexpensive and easy to use. One person can assemble and hook up in minutes. For working loads to approximately 6,000 pounds (ultimate strength — 18,000 pounds).

Catalog No.	Weight
E96	5 lb.



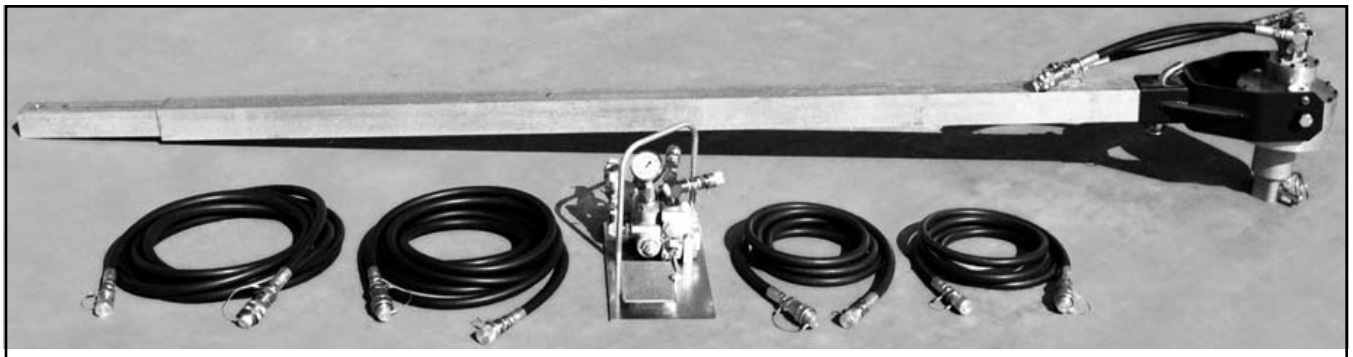
Portable Anchor Installers for small foundations

2,500 ft.-lb. torque capacity hydraulic power drive

Economical manual operation and portability for remote sites, common anchor installations

For most shaft-driven guy anchors and smaller screw foundations, these compact drivers get into areas where large equipment cannot go or is impractical. Operator does not need to resist the torque generated by anchor installation. Countertorque transmits through a torque bar from the drive head to the earth or other restraint. This frees the operator for the task of guiding the anchor path.

Built-in bypass valve limits output to 2,500-ft.-lb. maximum, two-way foot pedal gives operator direct control over drive and reverse directions, hoses (two 12-ft. and two 25-ft.) come with quick couplers for all connections from power supply to foot control to drive head. Pivoting drive-head yoke connects with bent-arm pin to square-tubular torque bar which telescopes from 8 feet to 10 feet as needed.



Catalog No. C3031032
Medium-Duty Installer requires 1550 psi at 8 gpm flow rate to deliver 2,500 ft.-lb. maximum torque.

Catalog No. C3031244
Heavy-Duty Installer requires 1,900 psi at 8 gpm flow rate to deliver 2,500 ft.-lb. maximum torque.

2,500 ft-lb Portable Anchor Installers

†Medium Duty — Catalog No. C3031032

Grease filled gear case. Single Catalog Number above includes all items below. Each item also may be ordered by separate number.	
* Hydraulic Control Valve	C3031031
Two 25-ft. Hydraulic Hoses	C4176121 (each)
* Hydraulic Drive Head	C3031180
Yoke Assembly	E3030680
* Two 12-ft. Hydraulic Hoses	E3030876 (pair)
Square Torque Bar Assembly	E3031041

Output shaft is 1½" square socket. Requires C3031230 and flanged drive tool (order separately) to install anchors other than 1½" square 1¼" round shaft.

* Note: Hydraulic components are not interchangeable between C3031032 and C3031244.

Heavy Duty — Catalog No. C3031244

Sealed oil-filled gear case. Single Catalog Number above includes all items below. Each item also may be ordered by separate number.	
* Hydraulic Control Valve	C3031247
Two 25-ft. Hydraulic Hoses	C4176121 (each)
* Hydraulic Drive Head	C3031233
Yoke Assembly	E3030680
* Two 12-ft. Hydraulic Hoses	E3031253 (pair)
Square Torque Bar Assembly	E3031041

Output Shaft is 2" Hex. - Requires Kelly Bar Adapter P630013 and flanged drive tool (order separately) to install all anchors.

* Note: Hydraulic components are not interchangeable between C3031032 and C3031244.

Anchor Drive Tools

See page 8 for details on tools to drive specific anchor types.

†Adapter Tool Catalog No. C3031230

†Note that all 5¼" bolt-circle tools may be connected directly to Heavy Duty Portable Anchor Installer Cat. No. C3031244. †Adapter Tool Cat. No. C3031230 is required to connect 5¼" bolt-circle tools to Medium Duty Portable Anchor Installer Cat. No. C3031032. If needed, order Adapter C3031230 as a separate item.

Optional Hydraulic Power Unit Catalog No. C3031201

For easy wheeling to worksite, hydraulic drive head and foot control secure by rubber strap included to angle braces atop the cart frame and hoses ride on handles.

Cart-mounted on ⅝"-diameter axle with two 4.80 x 8 inflatable (30psi) tires; 27¼" wide x 34½" high x 36" long; shipping weight with oil: 275 lb.

Hydraulic Pump with fan cooling system:

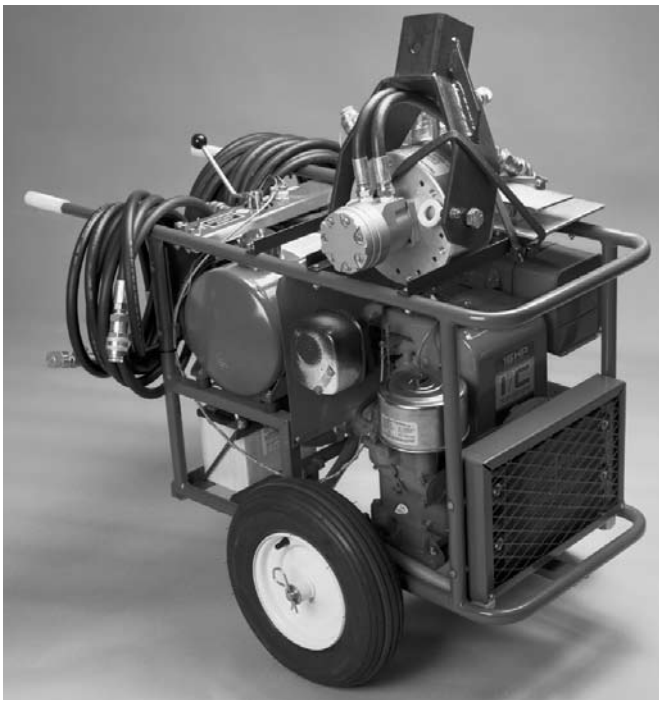
Typical output pressure	**2500psi**
Pump displacement	**8 gpm @ 3400rpm**
Reservoir capacity	**5 gallons US**

(shipping cap and vented fill cap provided)

Gasoline Engine System:

16hp Briggs & Stratton
Industrial/Commercial Model 326437, Type 2527
12-Volt pushbutton start, 3600rpm (maximum)

Operating instructions are included with anchor installer and hydraulic power unit.



HUBBELL POWER SYSTEMS, INC. CHANCE®

Anchor/Foundation Drive Heads

• Vehicle Mounted • Hydraulic Powered
• 3,500, 6,000 & 11,500 ft.-lb. Torque Ratings

Specially suited for vertical installations of screw-type anchors, foundations, and bumper posts.

The drive head comes in two torque-rating ranges. The design also delivers other features for rugged field conditions.

- Precision planetary gears and bearings in oil-filled, sealed gearcase
- Heavy-duty output housing and bearings
- Heavy-duty bail flange mounted to gearcase housing provides balanced load-sharing torque restraint
- Dual-pin mounting provides drive-head positioning for controlled installations
- Drive-head also readily accepts earth augers for hole digging

Hose assemblies are not furnished with drive heads. For hydraulic flow more than 20 gpm, $^{3}/_{4}$"-diameter hose is recommended. For flow rates of 20 gpm and below, $^{1}/_{2}$" hose may be used. Swivel joint and swivel joint adapter are furnished. Thread size is 1"-11$^{1}/_{2}$" NPSM (National Pipe Straight Mechanical).

Skid-Steer Utility Plate, Bail and Jib Components

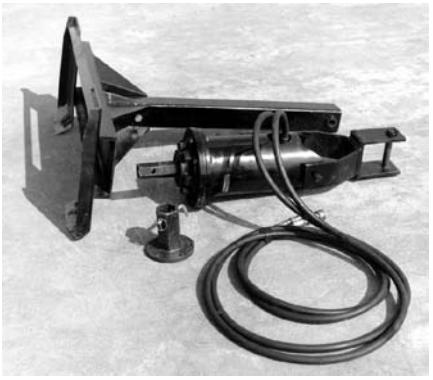
To order, refer to information below and on next page. Specify one each: Drive Head, Utility Plate, Bail & Jib Assembly, and Kelly Bar Adapter.

3,500 and 6,000 ft.-lb. maximum torque

For *Bobcat* Skid-Steers ONLY:

Catalog No.	Description
C3030999	3,500 ft.-lb. Utility Plate, Bail & Jib Assembly
C3031014	6,000 ft.-lb. Utility Plate, Bail & Jib Assembly

Catalog Numbers at left do not include drive head, hoses or kelly bar adapter as shown at right.



For Skid-Steers *other than Bobcat*:

(for field welding to utility plates on skid-steers)

C3031015	3,500 ft.-lb. Bail & Jib Assembly less Utility Plate
C3031016	6,000 ft.-lb. Bail & Jib Assembly less Utility Plate

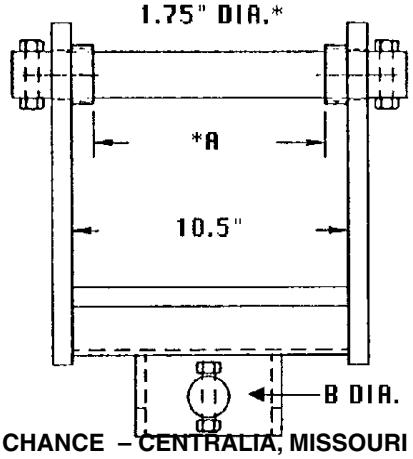
Backhoe Mounting Components

To order, specify components in Typical Tool-String Assemblies on next page.

3,500, 6,000 and 11,500 ft.-lb. maximum torque

†Backhoe Mounting Brackets

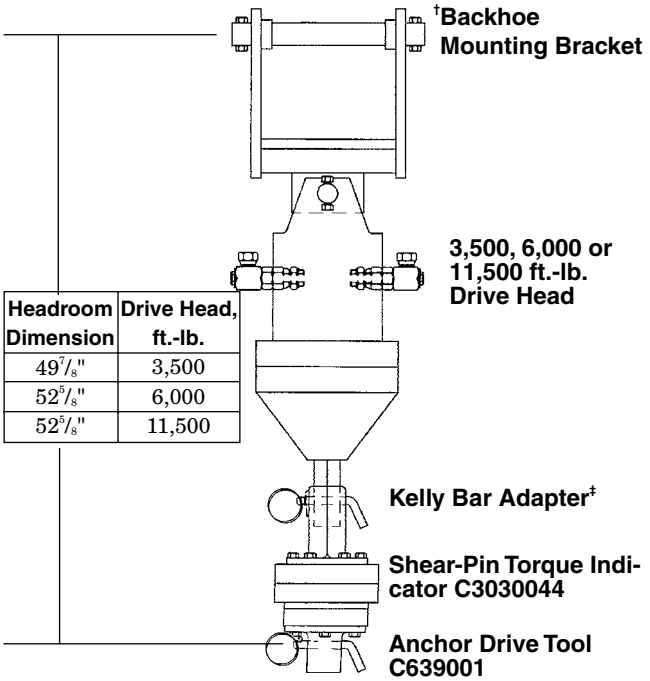
Dimensions, inches		Backhoe	Catalog	Bracket
*A	B	Brand Name	Number	Description
10.1	1.5	Case	C3030969	6K & 11.5K ft.-lb. Eskridge
10.1	1.0	Case	C3030970	3.5K ft.-lb. Eskridge
7.00	1.5	JCB	C3030971	6K & 11.5K ft.-lb. Eskridge
7.00	1.0	JCB	C3030972	3.5K ft.-lb. Eskridge
8.18	1.5	John Deere	C3030973	6K & 11.5K ft.-lb. Eskridge
8.18	1.0	John Deere	C3030974	3.5K ft.-lb. Eskridge



*Bracket accepts boom up to 10.2" wide (1.75" dia. pin).
For booms 7" & 8.18" wide, 2 spacer bushings supplied.
Other bushings available for backhoes not listed.

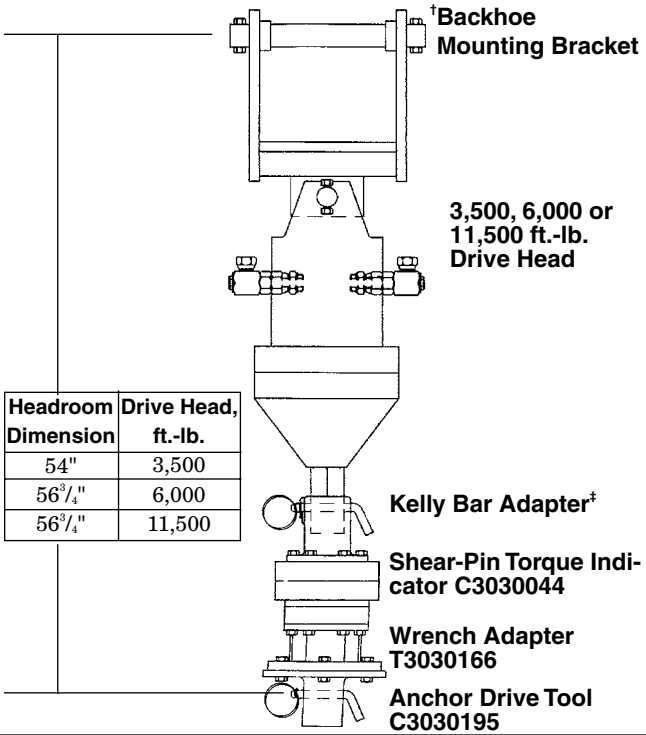
Typical BackhoeTool-Strings

For SS5 and SS150 (1½" Square Shaft) Series Anchors


†Backhoe Mounting Bracket
3,500, 6,000 or 11,500 ft.-lb. Drive Head
Kelly Bar Adapter‡
Shear-Pin Torque Indicator C3030044
Anchor Drive Tool C639001

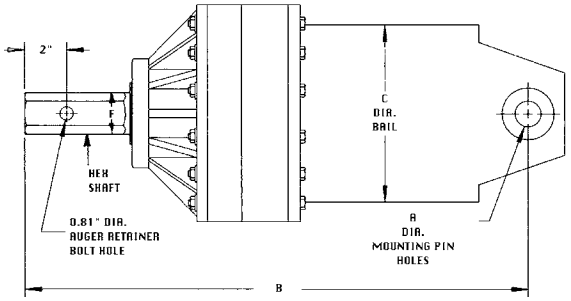
Headroom Dimension	Drive Head, ft.-lb.
49⅞"	3,500
52⅝"	6,000
52⅝"	11,500

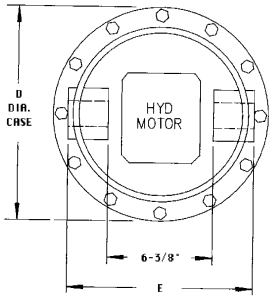
For SS175 (1¾" Square Shaft) Series Anchors


†Backhoe Mounting Bracket
3,500, 6,000 or 11,500 ft.-lb. Drive Head
Kelly Bar Adapter‡
Shear-Pin Torque Indicator C3030044
Wrench Adapter T3030166
Anchor Drive Tool C3030195

Headroom Dimension	Drive Head, ft.-lb.
54"	3,500
56¾"	6,000
56¾"	11,500

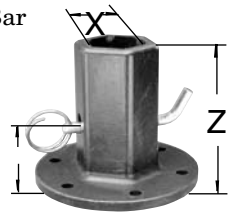
Anchor/Foundation Drive Heads





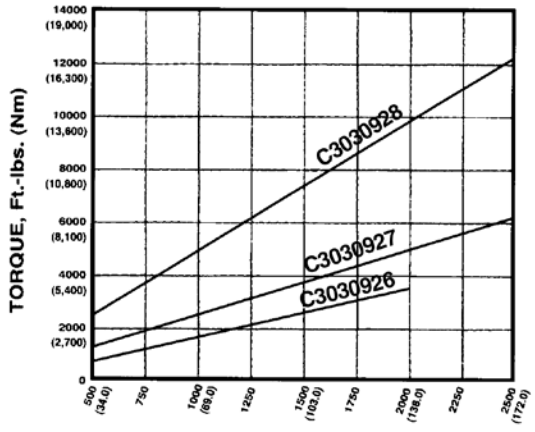
‡Kelly Bar Adapters

Each of these Kelly Bar Adapters has a 5¼" bolt circle and comes with (6) ½" bolts, nuts and lockwashers and a Bent-Arm Pin with Coil Lock (see page 4A-7).

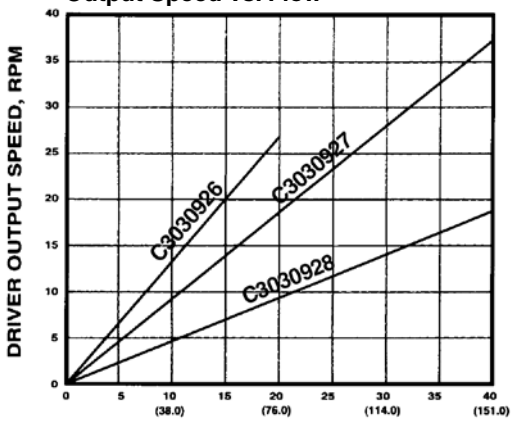


Part No.	X	Y	Z
630013	2" Hex	5"	6⅛"
630011HD	2½" Hex	4¼"	8⅛"

Output Torque vs. Pressure



Output Speed vs. Flow



Catalog Number	Running Torque ft.-lb.	Running Torque Nm	Flow gpm	Speed rpm	Wt. lb.	Wt. kg	Dimensions (in., cm) A		B		C		D		E		F	
C3030926	3,500 @ 2,000 psi	4,700 @ 140 BARS	20	28	151	69	1.0	2.54	26	66.0	8.5	21.6	11	27.9	8.75	22.2	2	5.1
C3030927	6,000 @ 2,400 psi	8,100 @ 165 BARS	40	39	246	112	1.5	3.81	29.5	74.9	10.7	27.2	13	33.0	11.4	28.9	2.5	6.4
C3030928	11,500 @ 2,400 psi	15,600 @ 165 BARS	40	20	246	112	1.5	3.81	29.5	74.9	10.7	27.2	13	33.0	11.4	28.9	2.5	6.4

BALDOR
A MEMBER OF THE ABB GROUP

BALDOR • RELIANCE

Product Information Packet

VL3514

1.5HP,1725RPM,1PH,60HZ,56C,3532LC,TEFC

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Part Detail

Revision:	AH	**Status:**	PRD/A	**Change #:**		**Proprietary:**	No
Type:	AC	**Prod. Type:**	3532LC	**Elec. Spec:**	35WGX944	**CD Diagram:**	
Enclosure:	TEFC	**Mfg Plant:**		**Mech. Spec:**	35E022	**Layout:**	
Frame:	56C	**Mounting:**	F1	**Poles:**	04	**Created Date:**	
Base:	N	**Rotation:**	R	**Insulation:**	B	**Eff. Date:**	10-27-2011
Leads:	4#16 A PH,3#18 B PH	**Literature:**		**Elec. Diagram:**		**Replaced By:**	

Nameplate NP1256L

CAT.NO.	VL3514						
SPEC.	35E22X944						
HP	1.5						
VOLTS	115/230						
AMP	18/8						
RPM	1725						
FRAME	56C	**HZ**	60	**PH**	1		
SER.F.	1.15	**CODE**	J	**DES**	L	**CLASS**	B
NEMA-NOM-EFF	75.5	**PF**	80				
RATING	40C AMB-CONT						
CC		**USABLE AT 208V**	8.4				
DE	6205	**ODE**	6203				
ENCL	TEFC	**SN**					

Parts List

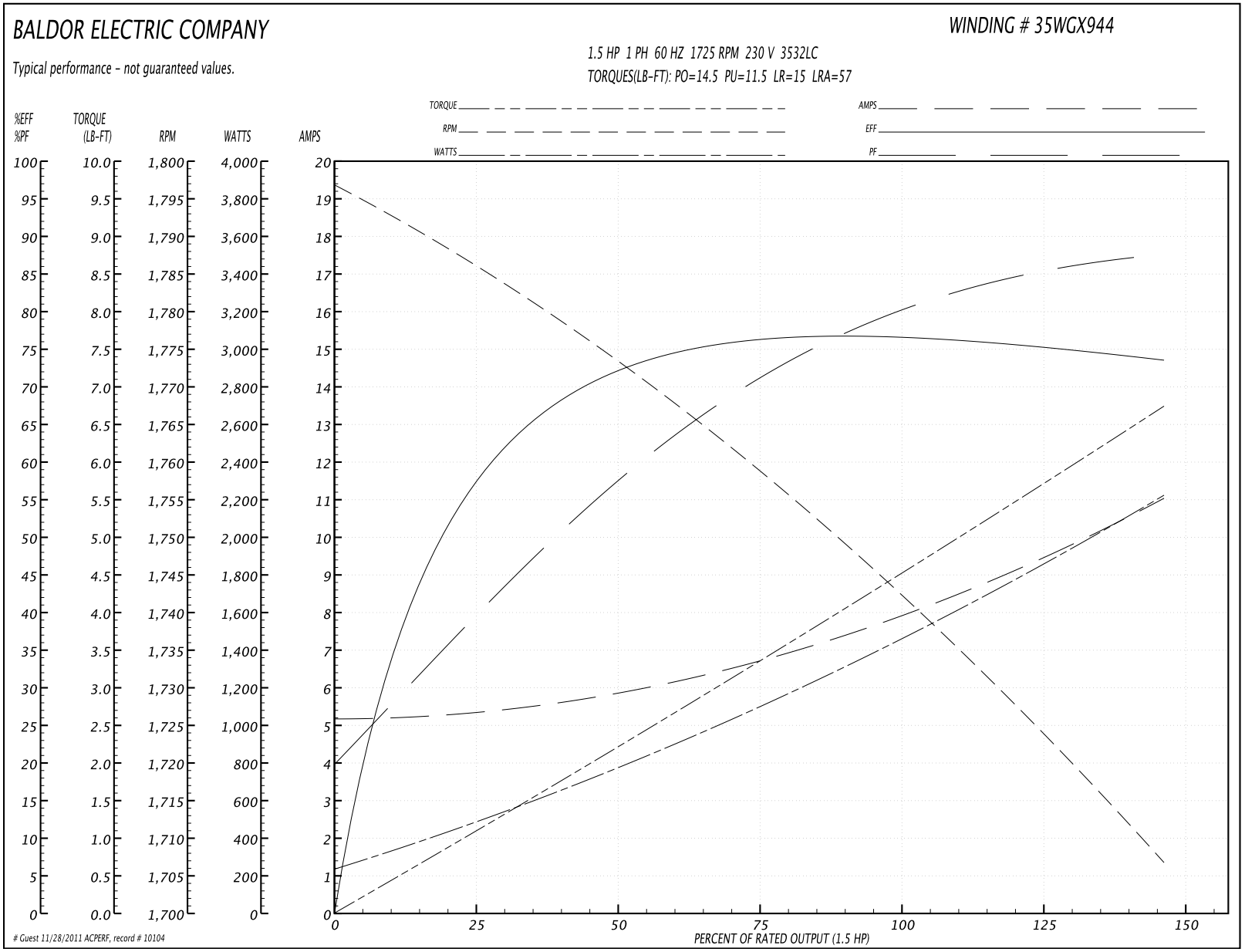
Part Number	Description	Quantity
SA023818	SA 35E22X944	1.000 EA
RA019868	RA 35E22X944	1.000 EA
OC3015F12SP	CYL OIL CAP 15MFD/370V	1.000 EA
EC1645A06SP	ELEC CAP, 645-774 MFD, 125V, 2.06D X 4.	1.000 EA
NS2512A01	INSULATOR, CONDUIT BOX X	1.000 EA
35CB3007	35 CB CASTING W/.88 DIA. LEAD HOLE	1.000 EA
36GS1000SP	GASKET-CONDUIT BOX, .06 THICK #SV-330 LE	1.000 EA
51XB1016A07	10-16 X 7/16 HXWSSLD SERTYB	2.000 EA
11XW1032G06	10-32 X .38, TAPTITE II, HEX WSHR SLTD U	1.000 EA
35EP3100M02	FREP TEFC 203 BRG W/O GRSR (RAISED FH MT	1.000 EA
51XW0832A07	8-32 X .44, TAPTITE II, HEX WSHR SLTD SE	2.000 EA
35CB3801SP	CAPACITOR COVER, CAST	1.000 EA
34GS3002	GASKET, CAPACITOR BOX	1.000 EA
HA7010	CAPACITOR RETENTION CLAMP	1.000 EA
NS2501A02	INSULATOR, CAPACITOR BOX	1.000 EA
51XB1016A08	10-16X 1/2HXWSSLD SERTYB	2.000 EA
HW5100A03SP	WAVY WASHER (W1543-017)	1.000 EA
35EP3300A33	SPL FACE MTD EP -ENCL-205 BRG	1.000 EA
51XN1032A20	10-32 X 1 1/4 HX WS SL SR	2.000 EA
35FN3002A05SP	EXFN, PLASTIC, 6.376 OD, .638 ID	1.000 EA
51XB1214A16	12-14X1.00 HXWSSLD SERTYB	1.000 EA
35FH4005A32SP	IEC FH NO GRSR W/3 HOLES - W/AUTOPHERETI	1.000 EA
51XW1032A06	10-32 X .38, TAPTITE II, HEX WSHR SLTD S	3.000 EA
35CB4521GX	CONDUIT BOX LID KIT	1.000 EA

Parts List (continued)

Part Number	Description	Quantity
51XW0832A07	8-32 X .44, TAPTITE II, HEX WSHR SLTD SE	4.000 EA
HW2501D13SP	KEY, 3/16 SQ X 1.375	1.000 EA
HA7000A04	KEY RETAINER 0.625 DIA SHAFTS	1.000 EA
85XU0407S04	4X1/4 U DRIVE PIN STAINLESS	2.000 EA
MJ1000A75	GREASE, POLYREX EM EXXON	0.050 LB
MG1000G27	PAINT- S9282E CHARCOAL GREY	0.017 GA
HA3100A18	THRUBOLT 10-32 X 9.250	4.000 EA
34GS5003	FOAM SLEEVE, ID = 2 1/16" X 3 3/8"	2.000 EA
WD1000A15	3-520132-2 AMP FLAG (4M/RL NON-CANC/NON-	4.000 EA
SP5056A61	MODEL 35 LC STATIONARY SWITCH LEAD ASSY	1.000 EA
LB1119	WARNING LABEL	1.000 EA
LB1125C01	STD (STOCK) CARTON LABEL BALDOR WITH FLA	1.000 EA
LC0016	CONNECTION LABEL	1.000 EA
NP1256L	ALUM, UL CSA CC, W/O THERMAL, LASER	1.000 EA
35PA1066	PACKING GROUP COMBINED PRINT	1.000 EA
PK3082	STYROFOAM CRADLE	1.000 EA

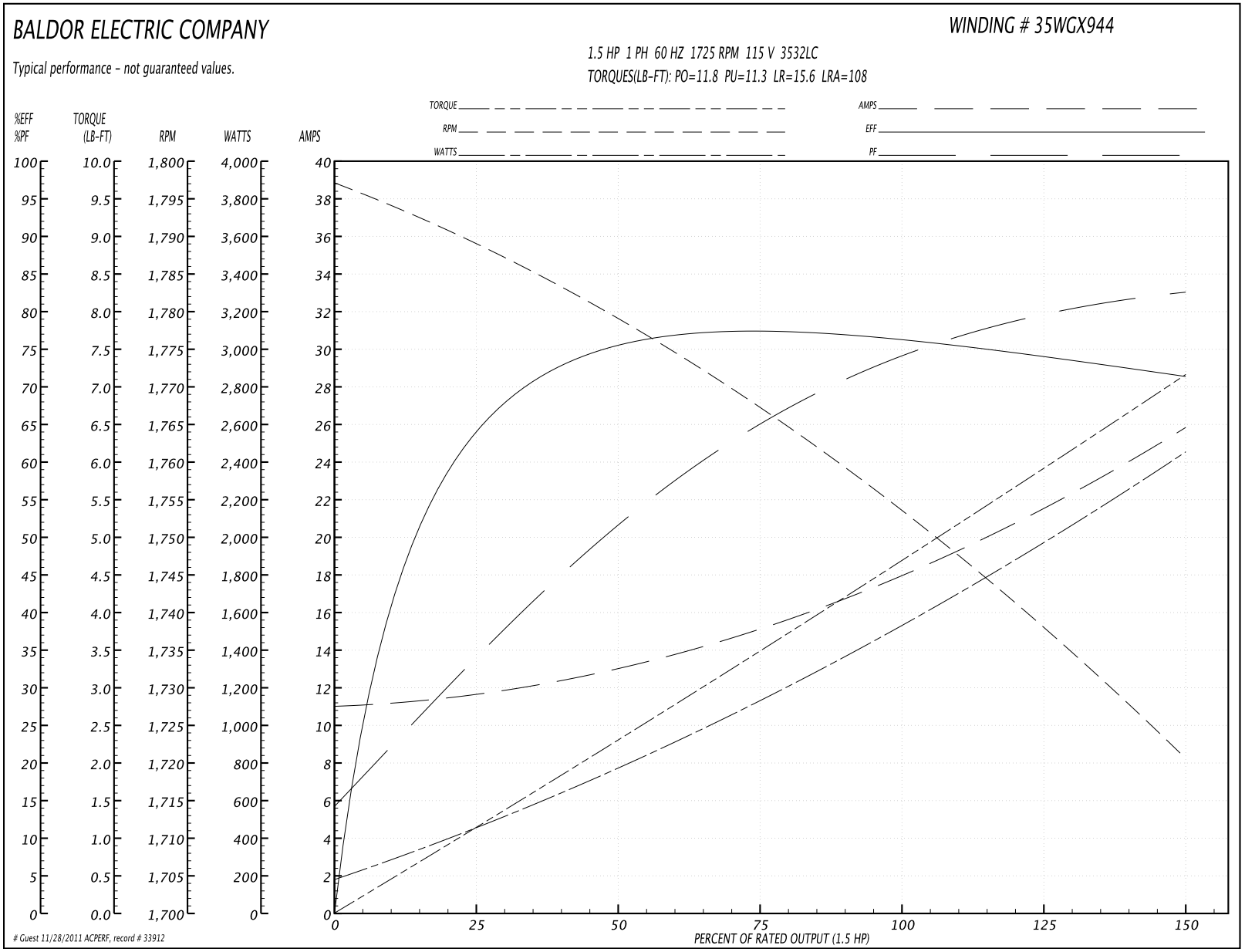
Performance Data at 230V, 60Hz, 1.5HP (Typical performance - Not guaranteed values)							
General Characteristics							
Full Load Torque:	4.5 LB-FT			**Start Configuration:**		DOL	
No-Load Current:	5.2 Amps			**Break-Down Torque:**		14.5 LB-FT	
Line-line Res. @ 25°C.:	1.41 Ohms A Ph / 1.18 Ohms B Ph			**Pull-Up Torque:**		11.5 LB-FT	
Temp. Rise @ Rated Load:	76 C			**Locked-Rotor Torque:**		15.0 LB-FT	
Temp. Rise @ S.F. Load:	90 C			**Starting Current:**		57.0 Amps	
Load Characteristics							
% of Rated Load	**25**	**50**	**75**	**100**	**125**	**150**	**S.F.**
Power Factor:	42.0	59.0	72.0	80.0	85.0	88.0	83.0
Efficiency:	59.1	71.6	76.1	76.6	75.7	73.4	76.1
Speed:	1784.0	1773.0	1759.0	1743.0	1726.0	1706.0	1733.0
Line Amperes:	5.3	5.9	6.7	7.9	9.4	11.0	8.8

Performance Graph at 230V, 60Hz, 1.5HP Typical performance - Not guaranteed values



Performance Data at 115V, 60Hz, 1.5HP (Typical performance - Not guaranteed values)							
General Characteristics							
Full Load Torque:	4.68 LB-FT			**Start Configuration:**		DOL	
No-Load Current:	11.0 Amps			**Break-Down Torque:**		11.8 LB-FT	
Line-line Res. @ 25°C.:	1.4399 Ohms A Ph / 1.1179 Ohms B Ph			**Pull-Up Torque:**		11.3 LB-FT	
Temp. Rise @ Rated Load:				**Locked-Rotor Torque:**		15.6 LB-FT	
Temp. Rise @ S.F. Load:				**Starting Current:**		108.0 Amps	
Load Characteristics							
% of Rated Load	**25**	**50**	**75**	**100**	**125**	**150**	**S.F.**
Power Factor:	33.0	52.0	63.0	74.0	79.0	83.0	77.0
Efficiency:	63.0	74.9	76.7	76.8	75.0	71.1	75.7
Speed:	1789.3	1778.9	1768.9	1754.5	1740.6	1720.2	1746.0
Line Amperes:	11.6	13.0	14.8	17.9	20.9	25.9	19.7

Performance Graph at 115V, 60Hz, 1.5HP Typical performance - Not guaranteed values



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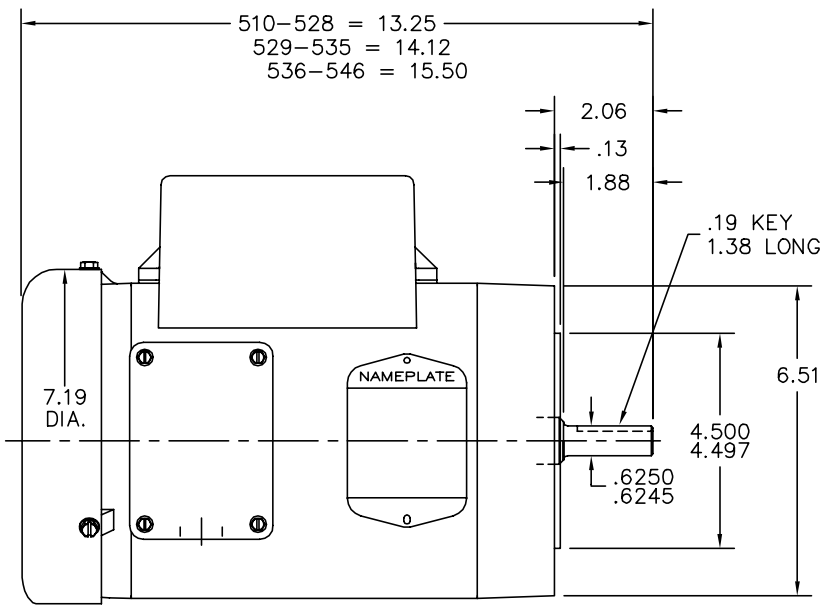
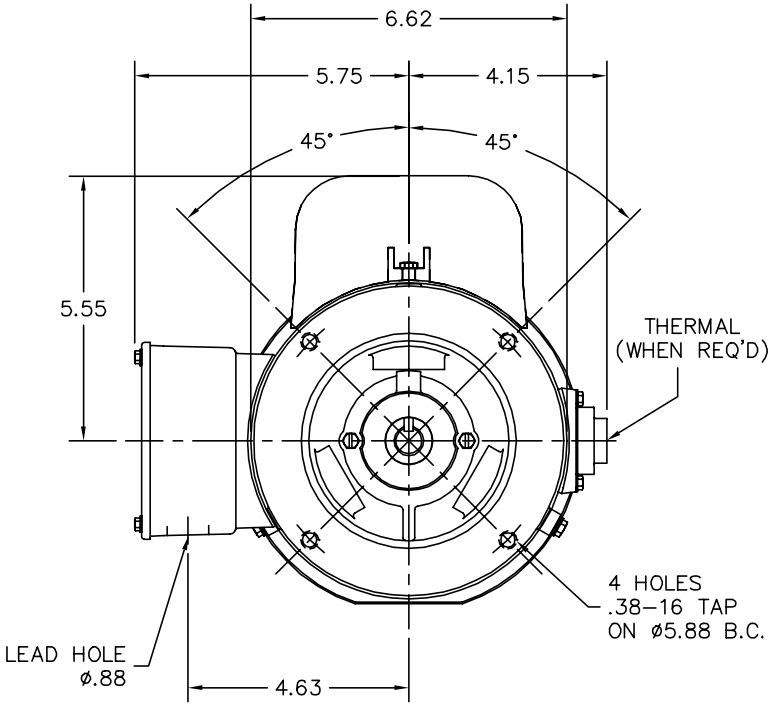


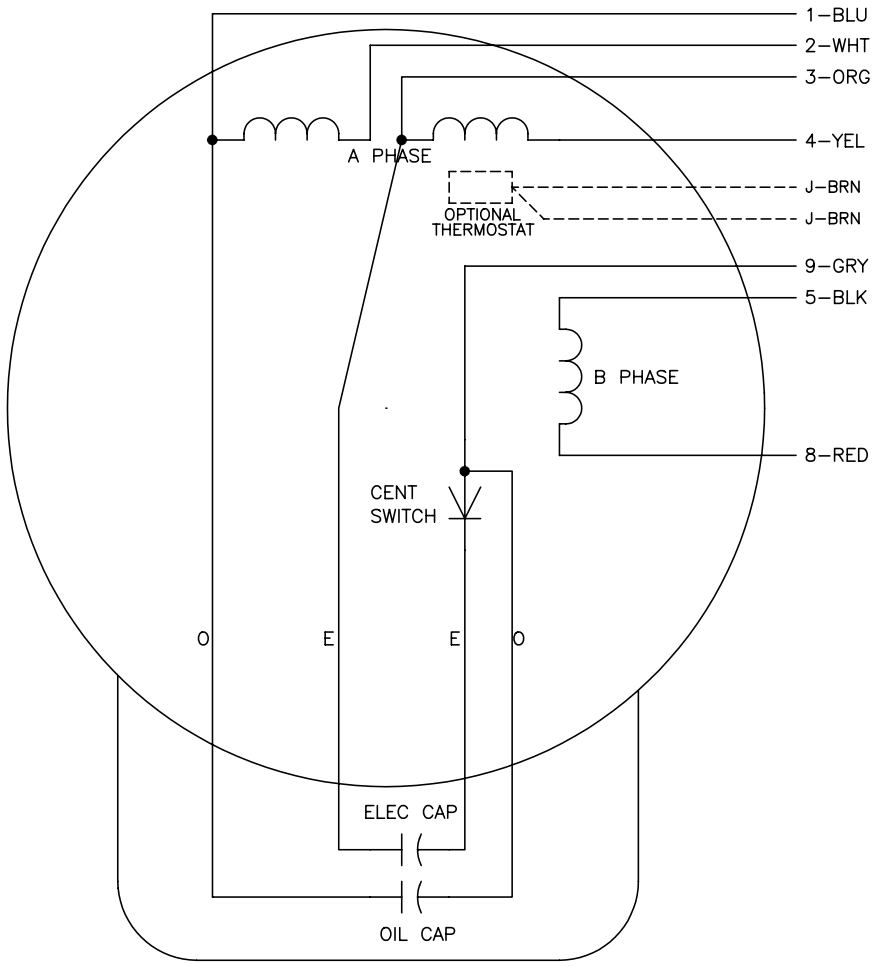


35LYE022

CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT BALDOR'S PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION.

REV. DESC: UPDATE KOLD GRAPHICS			BALDOR • DODGE • RELIANCE
REV. LTR: L	VERSION: 03	TDR: 000000486011	
FILE: \AAA\00004\912		REVISED: 13:36:46 01/05/2009	STD VERT 56C TEFC 35LC
MTL: –		BY: ENCHEB0	SH 1 of 1

CD0016A01



	LINE A	LINE B	JOIN	JOIN
HIGH STD	1	4,5	2,3	8,9
HIGH OPP	1	4,8	2,3	5,9
LOW STD	1,3	2,4,5	8,9	–
LOW OPP	1,3	2,4,8	5,9	–

NOTES:

1. STANDARD ROTATION IS CCW FACING END OPPOSITE SHAFT EXTENSION.
2. OPTIONAL THERMOSTAT IS PROVIDED WHEN SPECIFIED.
3. MULTIPLE CAPACITORS ARE CONNECTED IN PARALLEL UNLESS OTHERWISE SPECIFIED.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

REV. DESC: REVISE TO SHOW OPTIONAL COLORS			BALDOR ELECTRIC Co.
REV. LTR: E	BY: JLP	REVISED: 04/09/99 1:19	TDR: 0178636
CD0016A01		FILE: AAA00007410	MDL: –
		MTL: –	TYPE LC, DV, REV, OIL CAP ACR. LINE, 7 LEADS

CD0016A01

BALDOR • RELIANCE

Integral Horsepower
AC Induction Motors

Installation & Operating Manual

2/09 MN400

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Section 1
General Information

Overview This manual contains general procedures that apply to Baldor Motor products. Be sure to read and understand the Safety Notice statements in this manual. For your protection, do not install, operate or attempt to perform maintenance procedures until you understand the Warning and Caution statements.
A Warning statement indicates a possible unsafe condition that can cause harm to personnel.
A Caution statement indicates a condition that can cause damage to equipment.

Important: **This instruction manual is not intended to include a comprehensive listing of all details for all procedures required for installation, operation and maintenance. This manual describes general guidelines that apply to most of the motor products shipped by Baldor. If you have a question about a procedure or are uncertain about any detail, Do Not Proceed. Please contact your Baldor distributor for more information or clarification.**

Before you install, operate or perform maintenance, become familiar with the following:

- NEMA Publication MG-2, Safety Standard for Construction and guide for Selection, Installation and Use of Electric Motors and Generators.
- The National Electrical Code
- Local codes and Practices

Limited Warranty

www.baldor.com/support/warranty_standard.asp

Safety Notice: This equipment contains high voltage! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt installation, operation and maintenance of electrical equipment.

Be sure that you are completely familiar with NEMA publication MG-2, safety standards for construction and guide for selection, installation and use of electric motors and generators, the National Electrical Code and local codes and practices. Unsafe installation or use can cause conditions that lead to serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

WARNING: **Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.**

WARNING: **Disconnect all electrical power from the motor windings and accessory devices before disassembly of the motor. Electrical shock can cause serious or fatal injury.**

WARNING: **Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury. National Electrical Code and Local codes must be carefully followed.**

WARNING: **Avoid extended exposure to machinery with high noise levels. Be sure to wear ear protective devices to reduce harmful effects to your hearing.**

WARNING: **Surface temperatures of motor enclosures may reach temperatures which can cause discomfort or injury to personnel accidentally coming into contact with hot surfaces. When installing, protection should be provided by the user to protect against accidental contact with hot surfaces. Failure to observe this precaution could result in bodily injury.**

WARNING: **This equipment may be connected to other machinery that has rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt to install operate or maintain this equipment.**

WARNING: **Do not by-pass or disable protective devices or safety guards. Safety features are designed to prevent damage to personnel or equipment. These devices can only provide protection if they remain operative.**

WARNING: **Avoid the use of automatic reset devices if the automatic restarting of equipment can be hazardous to personnel or equipment.**

WARNING: **Be sure the load is properly coupled to the motor shaft before applying power. The shaft key must be fully captive by the load device. Improper coupling can cause harm to personnel or equipment if the load decouples from the shaft during operation.**

WARNING: **Use proper care and procedures that are safe during handling, lifting, installing, operating and maintaining operations. Improper methods may cause muscle strain or other harm.**

WARNING: **Thermostat contacts automatically reset when the motor has slightly cooled down. To prevent injury or damage, the control circuit should be designed so that automatic starting of the motor is not possible when the thermostat resets.**

Safety Notice Continued

WARNING: **UL Listed motors must only be serviced by UL Approved Authorized Baldor Service Centers if these motors are to be returned to a hazardous and/or explosive atmosphere.**

WARNING: **Pacemaker danger – Magnetic and electromagnetic fields in the vicinity of current carrying carrying conductors and permanent magnet motors can result result in a serious health hazard to persons with cardiac pacemakers, metal implants, and hearing aids. To avoid risk, stay way from the area surrounding a permanent magnet motor.**

WARNING: **Before performing any motor maintenance procedure, be sure that the equipment connected to the motor shaft cannot cause shaft rotation. If the load can cause shaft rotation, disconnect the load from the motor shaft before maintenance is performed. Unexpected mechanical rotation of the motor parts can cause injury or motor damage.**

WARNING: **Use only UL/CSA listed explosion proof motors in the presence of flammable or combustible vapors or dust.**

WARNING: **Motors that are to be used in flammable and/or explosive atmospheres must display the UL label on the nameplate along with CSA listed logo. Specific service conditions for these motors are defined in NFPA 70 (NEC) Article 500.**

WARNING: **Guards must be installed for rotating parts such as couplings, pulleys, external fans, and unused shaft extensions, should be permanently guarded to prevent accidental contact by personnel. Accidental contact with body parts or clothing can cause serious or fatal injury.**

Caution: **To prevent premature equipment failure or damage, only qualified maintenance personnel should perform maintenance.**

Caution: **Do not over–lubricate motor as this may cause premature bearing failure.**

Caution: **Do not over tension belts. Excess tension may damage the motor or driven equipment.**

Caution: **Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load (gears, pumps, compressors, or other driven equipment) from the motor shaft before lifting the motor.**

Caution: **If eye bolts are used for lifting a motor, be sure they are securely tightened. The lifting direction should not exceed a 20° angle from the shank of the eye bolt or lifting lug. Excessive lifting angles can cause damage.**

Caution: **To prevent equipment damage, be sure that the electrical service is not capable of delivering more than the maximum motor rated amps listed on the rating plate.**

Caution: **If a HI POT test (High Potential Insulation test) must be performed, follow the precautions and procedure in NEMA MG1 and MG2 standards to avoid equipment damage.**

If you have any questions or are uncertain about any statement or procedure, or if you require additional information please contact your Baldor distributor or an Authorized Baldor Service Center.

Receiving

Each Baldor Electric Motor is thoroughly tested at the factory and carefully packaged for shipment. When you receive your motor, there are several things you should do immediately.

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your motor.
2. Verify that the part number of the motor you received is the same as the part number listed on your purchase order.

Handling

The motor should be lifted using the lifting lugs or eye bolts provided.

Caution: **Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load (gears, pumps, compressors, or other driven equipment) from the motor shaft before lifting the motor.**

1. Use the lugs or eye bolts provided to lift the motor. Never attempt to lift the motor and additional equipment connected to the motor by this method. The lugs or eye bolts provided are designed to lift only the motor. Never lift the motor by the motor shaft or the hood of a WPII motor.
2. To avoid condensation inside the motor, do not unpack until the motor has reached room temperature. (Room temperature is the temperature of the room in which it will be installed). The packing provides insulation from temperature changes during transportation.
3. When lifting a WPII (Weather Proof Type 2) motor, do not lift the motor by inserting lifting lugs into holes on top of the cooling hood. These lugs are to be used for hood removal only. A spreader bar should be used to lift the motor by the cast lifting lugs located on the motor frame.

4. If the motor must be mounted to a plate with the driven equipment such as pump, compressor etc., it may not be possible to lift the motor alone. For this case, the assembly should be lifted by a sling around the mounting base. The entire assembly can be lifted as an assembly for installation.

   Do not lift the assembly using the motor lugs or eye bolts provided. Lugs or eye bolts are designed to lift motor only. If the load is unbalanced (as with couplings or additional attachments) additional slings or other means must be used to prevent tipping. In any event, the load must be secure before lifting. If the load is unbalanced (as with couplings or additional attachments) additional slings or other means must be used to prevent tipping. In any event, the load must be secure before lifting.

Storage

Storage requirements for motors and generators that will not be placed in service for at least six months from date of shipment.

Improper motor storage will result in seriously reduced reliability and failure. An electric motor that does not experience regular usage while being exposed to normally humid atmospheric conditions is likely to develop rust in the bearings or rust particles from surrounding surfaces may contaminate the bearings. The electrical insulation may absorb an excessive amount of moisture leading to the motor winding failure.

A wooden crate “shell” should be constructed to secure the motor during storage. This is similar to an export box but the sides & top must be secured to the wooden base with lag bolts (not nailed as export boxes are) to allow opening and reclosing many times without damage to the “shell”.

Minimum resistance of motor winding insulation is 5 Meg ohms or the calculated minimum, which ever is greater. Minimum resistance is calculated as follows: **Rm = kV + 1**

where: (Rm is minimum resistance to ground in Meg−Ohms and
kV is rated nameplate voltage defined as Kilo−Volts.)

Example: For a 480VAC rated motor Rm =1.48 meg−ohms (use 5 MΩ).
For a 4160VAC rated motor Rm = 5.16 meg−ohms.

Preparation for Storage

1. Some motors have a shipping brace attached to the shaft to prevent damage during transportation. The shipping brace, if provided, must be removed and stored for future use. The brace must be reinstalled to hold the shaft firmly in place against the bearing before the motor is moved.
2. Store in a clean, dry, protected warehouse where control is maintained as follows:
   a. Shock or vibration must not exceed 2 mils maximum at 60 hertz, to prevent the bearings from brinelling. If shock or vibration exceeds this limit vibration isolation pads must be used.
   b. Storage temperatures of 10°C (50°F) to 49°C (120°F) must be maintained.
   c. Relative humidity must not exceed 60%.
   d. Motor space heaters (when present) are to be connected and energized whenever there is a possibility that the storage ambient conditions will reach the dew point. Space heaters are optional.

   Note: Remove motor from containers when heaters are energized, reprotect if necessary.
3. Measure and record the resistance of the winding insulation (dielectric withstand) every 30 days of storage.
   a. If motor insulation resistance decreases below the minimum resistance, contact your Baldor District office.
   b. Place new desiccant inside the vapor bag and re−seal by taping it closed.
   c. If a zipper−closing type bag is used instead of the heat−sealed type bag, zip the bag closed instead of taping it. Be sure to place new desiccant inside bag after each monthly inspection.
   d. Place the shell over the motor and secure with lag bolts.
4. Where motors are mounted to machinery, the mounting must be such that the drains and breathers are fully operable and are at the lowest point of the motor. Vertical motors must be stored in the vertical position. Storage environment must be maintained as stated in step 2.

5. Motors with anti−friction bearings are to be greased at the time of going into extended storage with periodic service as follows:
   a. Motors marked “Do Not Lubricate” on the nameplate do not need to be greased before or during storage.
   b. Ball and roller bearing (anti−friction) motor shafts are to be rotated manually every 3 months and greased every 6 months in accordance with the Maintenance section of this manual.
   c. Sleeve bearing (oil lube) motors are drained of oil prior to shipment. The oil reservoirs must be refilled to the indicated level with the specified lubricant, (see Maintenance). The shaft should be rotated monthly by hand at least 10 to 15 revolutions to distribute oil to bearing surfaces.
   d. “Provisions for oil mist lubrication” − These motors are packed with grease. Storage procedures are the same as paragraph 5b.
   e. “Oil Mist Lubricated” − These bearings are protected for temporary storage by a corrosion inhibitor. If stored for greater than 3 months or outdoor storage is anticipated, connected to the oil mist system while in storage. If this is not possible, add the amount of grease indicated under “Standard Condition” in Section 3, then rotate the shaft 15 times by hand.
6. All breather drains are to be fully operable while in storage (drain plugs removed). The motors must be stored so that the drain is at the lowest point. All breathers and automatic “T” drains must be operable to allow breathing and draining at points other than through the bearings around the shaft. Vertical motors should be stored in a safe stable vertical position.
7. Coat all external machined surfaces with a rust preventing material. An acceptable product for this purpose is Exxon Rust Ban # 392.

Non−Regreaseable Motors

Non−regreasable motors with “Do Not Lubricate” on the nameplate should have the motor shaft rotated 15 times to redistribute the grease within the bearing every 3 months or more often.

All Other Motor Types

Before storage, the following procedure must be performed.

1. Remove the grease drain plug, if supplied, (opposite the grease fitting) on the bottom of each bracket prior to lubricating the motor.
2. The motor with regreasable bearing must be greased as instructed in Section 3 of this manual.
3. Replace the grease drain plug after greasing.
4. The motor shaft must be rotated a minimum of 15 times after greasing.
5. Motor Shafts are to be rotated at least 15 revolutions manually every 3 months and additional grease added every nine months (see Section 3) to each bearing.
6. Bearings are to be greased at the time of removal from storage.

Removal From Storage

1. Remove all packing material.
2. Measure and record the electrical resistance of the winding insulation resistance meter at the time of removal from storage. The insulation resistance must not be less than 50% from the initial reading recorded when the motor was placed into storage. A decrease in resistance indicates moisture in the windings and necessitates electrical or mechanical drying before the motor can be placed into service. If resistance is low, contact your Baldor District office.
3. Regrease the bearings as instructed in Section 3 of this manual.
4. Reinstall the original shipping brace if motor is to be moved. This will hold the shaft firmly against the bearing and prevent damage during movement.

Section 2
Installation & Operation

Overview Installation should conform to the National Electrical Code as well as local codes and practices. When other devices are coupled to the motor shaft, be sure to install protective devices to prevent future accidents. Some protective devices include, coupling, belt guard, chain guard, shaft covers etc. These protect against accidental contact with moving parts. Machinery that is accessible to personnel should provide further protection in the form of guard rails, screening, warning signs etc.

Location It is important that motors be installed in locations that are compatible with motor enclosure and ambient conditions. Improper selection of the motor enclosure and ambient conditions can lead to reduced operating life of the motor.

Proper ventilation for the motor must be provided. Obstructed airflow can lead to reduction of motor life.

1. **Open Drip−Proof/WPI** motors are intended for use indoors where atmosphere is relatively clean, dry, well ventilated and non−corrosive.
2. **Totally Enclosed and WPII** motors may be installed where dirt, moisture or dust are present and in outdoor locations.

Severe Duty, IEEE 841 and Washdown Duty enclosed motors are designed for installations with high corrosion or excessive moisture conditions. These motors should not be placed into an environment where there is the presence of flammable or combustible vapors, dust or any combustible material, unless specifically designed for this type of service.

Hazardous Locations are those where there is a risk of ignition or explosion due to the presence of combustible gases, vapors, dust, fibers, or flyings. Facilities requiring special equipment for hazardous locations are typically classified in accordance with local requirements. In the US market, guidance is provided by the National Electric Code.

Caution: **Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load (gears, pumps, compressors, or other driven equipment) from the motor shaft before lifting the motor.**

Mounting The motor must be securely installed to a rigid foundation or mounting surface to minimize vibration and maintain alignment between the motor and shaft load. Failure to provide a proper mounting surface may cause vibration, misalignment and bearing damage.

Foundation caps and sole plates are designed to act as spacers for the equipment they support. If these devices are used, be sure that they are evenly supported by the foundation or mounting surface.

After installation is complete and accurate alignment of the motor and load is accomplished, the base should be grouted to the foundation to maintain this alignment.

The standard motor base is designed for horizontal or vertical mounting. Adjustable or sliding rails are designed for horizontal mounting only. Consult your Baldor distributor or authorized Baldor Service Center for further information.

Alignment Accurate alignment of the motor with the driven equipment is extremely important. The pulley, sprocket, or gear used in the drive should be located on the shaft as close to the shaft shoulder as possible. It is recommended to heat the pulley, sprocket, or gear before installing on the motor shaft. Forcibly driving a unit on the motor shaft will damage the bearings.

1. **Direct Coupling**
   For direct drive, use flexible couplings if possible. Consult the drive or equipment manufacturer for more information. Mechanical vibration and roughness during operation may indicate poor alignment. Use dial indicators to check alignment. The space between coupling hubs should be maintained as recommended by the coupling manufacturer.
2. **End-Play Adjustment**
   The axial position of the motor frame with respect to its load is also extremely important. The motor bearings are not designed for excessive external axial thrust loads. Improper adjustment will cause failure.
3. **Pulley Ratio**
   The pulley ratio should not exceed 8:1.

Caution: **Do not over tension belts. Excess tension may damage the motor or driven equipment.**

4. **Belt Drive**
   Align sheaves carefully to minimize belt wear and axial bearing loads (see End-Play Adjustment). Belt tension should be sufficient to prevent belt slippage at rated speed and load. However, belt slippage may occur during starting.
5. Sleeve bearing motors are only suitable for coupled loads.

Doweling & Bolting After proper alignment is verified, dowel pins should be inserted through the motor feet into the foundation. This will maintain the correct motor position should motor removal be required. (Baldor motors are designed for doweling.)

1. Drill dowel holes in diagonally opposite motor feet in the locations provided.
2. Drill corresponding holes in the foundation.
3. Ream all holes.
4. Install proper fitting dowels.
5. Mounting bolts must be carefully tightened to prevent changes in alignment. Use a flat washer and lock washer under each nut or bolt head to hold the motor feet secure. Flanged nuts or bolts may be used as an alternative to washers.

WARNING: Guards must be installed for rotating parts such as couplings, pulleys, external fans, and unused shaft extensions, should be permanently guarded to prevent accidental contact by personnel. Accidental contact with body parts or clothing can cause serious or fatal injury.

Guarding Guards must be installed for rotating parts such as couplings, pulleys, external fans, and unused shaft extensions. This is particularly important where the parts have surface irregularities such as keys, key ways or set screws. Some satisfactory methods of guarding are:

1. Covering the machine and associated rotating parts with structural or decorative parts of the driven equipment.
2. Providing covers for the rotating parts. Covers should be sufficiently rigid to maintain adequate guarding during normal service.

Power Connection Motor and control wiring, overload protection, disconnects, accessories and grounding should conform to the National Electrical Code and local codes and practices. Flying leads must be insulated with two full wraps of electrical grade insulating tape or heat shrink tubing.

Conduit Box For ease of making connections, an oversize conduit box is provided.
The box can be rotated 360° in 90° increments.
Auxiliary conduit boxes are provided on some motors for accessories such as space heaters, RTD's etc.

AC Power Connect the motor leads as shown on the connection diagram located on the name plate or inside the cover on the conduit box. Be sure the following guidelines are met:

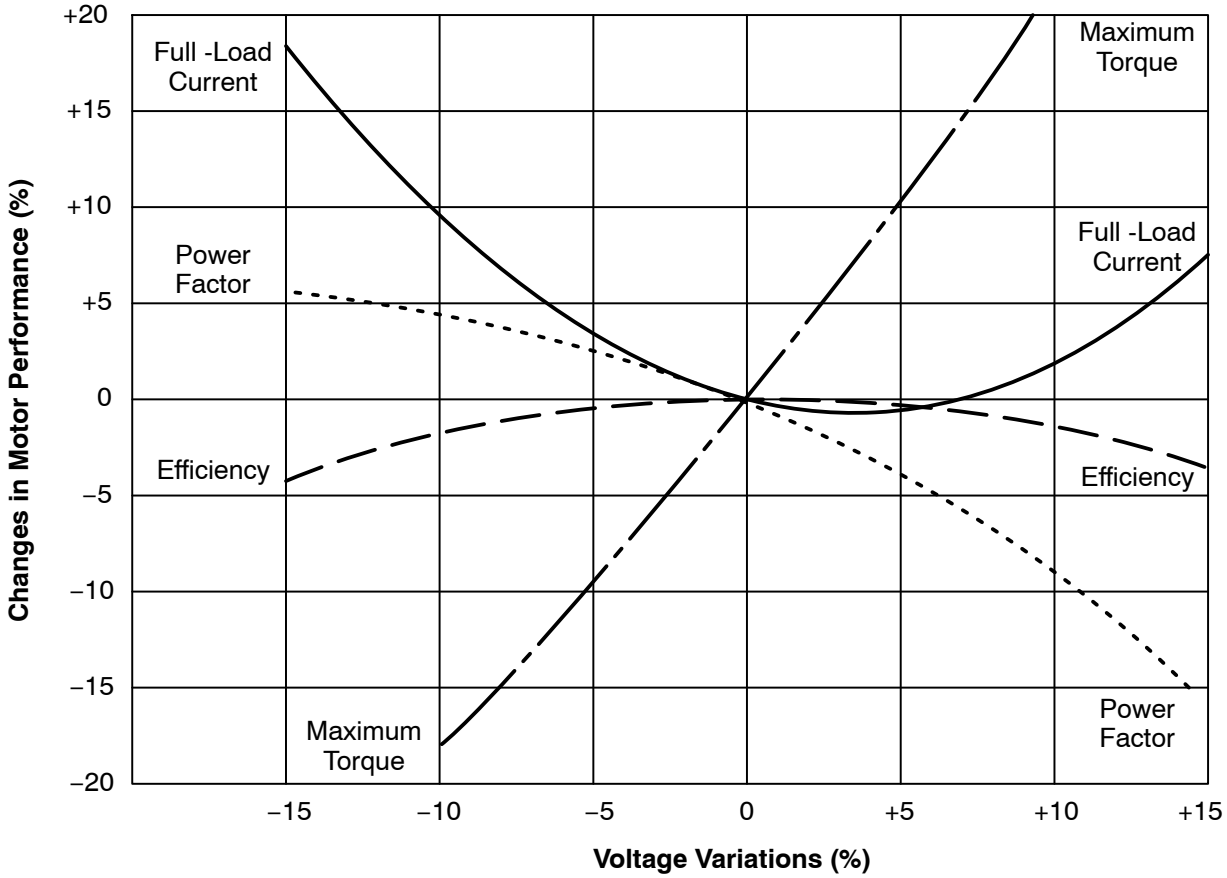
1. AC power is within ±10% of rated voltage with rated frequency. (See motor name plate for ratings).
   OR
2. AC power is within ±5% of rated frequency with rated voltage.
   OR
3. A combined variation in voltage and frequency of ±10% (sum of absolute values) of rated values, provided the frequency variation does not exceed ±5% of rated frequency.

Performance within these voltage and frequency variations are shown in Figure 2-2.

Figure 2-1 Accessory Connections

HEATERS H1 — H2 H1 — H2	One heater is installed in each end of motor. Leads for each heater are labeled H1 & H2. (Like numbers should be tied together).
THERMISTORS T1 — T2	Three thermistors are installed in windings and tied in series. Leads are labeled T1 & T2.
WINDING RTDS RED RED WHITE	Winding RTDs are installed in windings (2) per phase. Each set of leads is labeled W1, W2, W3, W4, W5, & W6.
BEARING RTD RED RED WHITE	* One bearing RTD is installed in Drive endplate (PUEP), leads are labeled RTDDE. * One bearing RTD is installed in Opposite Drive endplate (FREP), leads are labeled RTDODE. * Note RTD may have 2–Red/1–White leads; or 2–White/1–Red Lead.

Figure 2-2 Typical Motor Performance VS Voltage Variations



Rotation All three phase motors are reversible. To reverse the direction of rotation, disconnect and lock out power and interchange any two of the three line leads for three phase motors. For single phase motors, check the connection diagram to determine if the motor is reversible and follow the connection instructions for lead numbers to be interchanged. Not all single phase motors are reversible.

Adjustable Frequency Power Inverters used to supply adjustable frequency power to induction motors produce wave forms with lower order harmonics with voltage spikes superimposed. Turn−to−turn, phase−to−phase, and ground insulation of stator windings are subject to the resulting dielectric stresses. Suitable precautions should be taken in the design of these drive systems to minimize the magnitude of these voltage spikes. Consult the drive instructions for maximum acceptable motor lead lengths, and proper grounding.

First Time Start Up Be sure that all power to motor and accessories is off. Be sure the motor shaft is disconnected from the load and will not cause mechanical rotation of the motor shaft.

1. Make sure that the mechanical installation is secure. All bolts and nuts are tightened etc.
2. If motor has been in storage or idle for some time, check winding insulation integrity.
3. Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity.
4. Be sure all shipping materials and braces (if used) are removed from motor shaft.
5. Manually rotate the motor shaft to ensure that it rotates freely.
6. Replace all panels and covers that were removed during installation.
7. Momentarily apply power and check the direction of rotation of the motor shaft.
8. If motor rotation is wrong, be sure power is off and change the motor lead connections. Verify rotation direction before you continue.
9. Start the motor and ensure operation is smooth without excessive vibration or noise. If so, run the motor for 1 hour with no load connected.
10. After 1 hour of operation, disconnect power and connect the load to the motor shaft. Verify all coupling guards and protective devices are installed. Ensure motor is properly ventilated.

Coupled Start Up This procedure assumes a coupled start up. Also, that the first time start up procedure was successful.

1. Check the coupling and ensure that all guards and protective devices are installed.
2. Check that the coupling is properly aligned and not binding.
3. The first coupled start up should be with no load. Apply power and verify that the load is not transmitting excessive vibration back to the motor though the coupling or the foundation. Vibration should be at an acceptable level.
4. Run for approximately 1 hour with the driven equipment in an unloaded condition.

The equipment can now be loaded and operated within specified limits. Do not exceed the name plate ratings for amperes for steady continuous loads.

Jogging and Repeated Starts Repeated starts and/or jogs of induction motors generally reduce the life of the motor winding insulation. A much greater amount of heat is produced by each acceleration or jog than by the same motor under full load. If it is necessary to repeatedly start or jog the motor, it is advisable to check the application with your local Baldor distributor or Baldor Service Center.

Heating - Duty rating and maximum ambient temperature are stated on the motor name plate. Do not exceed these values. If there is any question regarding safe operation, contact your local Baldor District Office or Baldor Service Center.

Section 3
Maintenance & Troubleshooting

WARNING: UL Listed motors must only be serviced by UL Approved Authorized Baldor Service Centers if these motors are to be returned to a hazardous and/or explosive atmosphere.

General Inspection Inspect the motor at regular intervals, approximately every 500 hours of operation or every 3 months, whichever occurs first. Keep the motor clean and the ventilation openings clear. The following steps should be performed at each inspection:

WARNING: Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

1. Check that the motor is clean. Check that the interior and exterior of the motor is free of dirt, oil, grease, water, etc. Oily vapor, paper pulp, textile lint, etc. can accumulate and block motor ventilation. If the motor is not properly ventilated, overheating can occur and cause early motor failure.
2. Use a “Megger” periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
3. Check all electrical connectors to be sure that they are tight.

Relubrication & Bearings Bearing grease will lose its lubricating ability over time, not suddenly. The lubricating ability of a grease (over time) depends primarily on the type of grease, the size of the bearing, the speed at which the bearing operates and the severity of the operating conditions. Good results can be obtained if the following recommendations are used in your maintenance program.

Type of Grease A high grade ball or roller bearing grease should be used. Recommended grease for standard service conditions is **Polyrex EM (Mobil)**. Do not mix greases unless compatibility has been checked and verified.

Equivalent and compatible greases include:
Texaco Polystar, Rykon Premium #2, Pennzoil Pen 2 Lube and Chevron SRI.

Relubrication Intervals Recommended relubrication intervals are shown in Table 3-1. It is important to realize that the recommended intervals of Table 3-1 are based on average use.

Refer to additional information contained in Tables 3-2, 3-3 and 3-4.

Table 3-1 Relubrication Intervals *

NEMA / (IEC) Frame Size	Rated Speed - RPM					
	10000	6000	3600	1800	1200	900
Up to 210 incl. (132)	**	2700 Hrs.	5500 Hrs.	12000 Hrs.	18000 Hrs.	22000 Hrs.
Over 210 to 280 incl. (180)		**	3600 Hrs.	9500 Hrs.	15000 Hrs.	18000 Hrs.
Over 280 to 360 incl. (225)		**	* 2200 Hrs.	7400 Hrs.	12000 Hrs.	15000 Hrs.
Over 360 to 5800 incl. (300)		**	*2200 Hrs.	3500 Hrs.	7400 Hrs.	10500 Hrs.

* Relubrication intervals are for ball bearings.
For vertically mounted motors and roller bearings, divide the relubrication interval by 2.

** For motors operating at speeds greater than 3600 RPM, contact Baldor for relubrication recommendations.

Table 3-2 Service Conditions

Severity of Service	Hours per day of Operation	Ambient Temperature Maximum	Atmospheric Contamination
Standard	8	40° C	Clean, Little Corrosion
Severe	16 Plus	50° C	Moderate dirt, Corrosion
Extreme	16 Plus	>50° C* or Class H Insulation	Severe dirt, Abrasive dust, Corrosion, Heavy Shock or Vibration
Low Temperature		<–29° C **	

* Special high temperature grease is recommended (Dow Corning DC44). Note that Dow Corning DC44 grease does not mix with other grease types. Thoroughly clean bearing & cavity before adding grease.

** Special low temperature grease is recommended (Aeroshell 7).

Table 3-3 Relubrication Interval Multiplier

Severity of Service	Multiplier
Standard	1.0
Severe	0.5
Extreme	0.1
Low Temperature	1.0

Some motor designs use different bearings on each motor end. This is normally indicated on the motor nameplate. In this case, the larger bearing is installed on the motor Drive endplate. For best relubrication results, only use the appropriate amount of grease for each bearing size (not the same for both).

Table 3-4 Bearings Sizes and Types

Frame Size NEMA (IEC)	Bearing Description (These are the "Large" bearings (Shaft End) in each frame size)			
	Bearing	Weight of Grease to add * oz (Grams)	Volume of grease to be added	
			in^3	teaspoon
56 to 140 (90)	6203	0.08 (2.4)	0.15	0.5
140 (90)	6205	0.15 (3.9)	0.2	0.8
180 (100–112)	6206	0.19 (5.0)	0.3	1.0
210 (132)	6307	0.30 (8.4)	0.6	2.0
250 (160)	6309	0.47 (12.5)	0.7	2.5
280 (180)	6311	0.61 (17)	1.2	3.9
320 (200)	6312	0.76 (20.1)	1.2	4.0
360 (225)	6313	0.81 (23)	1.5	5.2
400 (250)	6316	1.25 (33)	2.0	6.6
440 (280)	6319	2.12 (60)	4.1	13.4
5000 to 5800 (315–450)	6328	4.70 (130)	9.2	30.0
5000 to 5800 (315–450)	NU328	4.70 (130)	9.2	30.0
360 to 449 (225–280)	NU319	2.12 (60)	4.1	13.4
AC Induction Servo				
76 Frame 180 (112)	6207	0.22 (6.1)	0.44	1.4
77 Frame 210 (132)	6210	0.32 (9.0)	0.64	2.1
80 Frame 250(160)	6213	0.49 (14.0)	0.99	3.3

* Weight in grams = .005 DB of grease to be added

Note: Not all bearing sizes are listed. For intermediate bearing sizes, use the grease volume for the next larger size bearing.

Caution: To avoid damage to motor bearings, grease must be kept free of dirt. For an extremely dirty environment, contact your Baldor distributor or an authorized Baldor Service Center for additional information.

Relubrication Procedure Be sure that the grease you are adding to the motor is compatible with the grease already in the motor. Consult your Baldor distributor or an authorized service center if a grease other than the recommended type is to be used.

Caution: Do not over−lubricate motor as this may cause premature bearing failure.

With Grease Outlet Plug

1. With the motor stopped, clean all grease fittings with a clean cloth.
2. Remove grease outlet plug.

Caution: Over−lubricating can cause excessive bearing temperatures, premature lubrication breakdown and bearing failure.

3. Add the recommended amount of grease.
4. Operate the motor for 15 minutes with grease plug removed. This allows excess grease to purge.
5. Re-install grease outlet plug.

Without Grease Provisions

Note: Only a Baldor authorized and UL or CSA certified service center can disassemble a UL/CSA listed explosion proof motor to maintain it's UL/CSA listing.

1. Disassemble the motor.
2. Add recommended amount of grease to bearing and bearing cavity. (Bearing should be about 1/3 full of grease and outboard bearing cavity should be about 1/2 full of grease.)
3. Assemble the motor.

Sample Relubrication Determination

Assume - NEMA 286T (IEC 180), 1750 RPM motor driving an exhaust fan in an ambient temperature of 43° C and the atmosphere is moderately corrosive.

1. Table 3-1 list 9500 hours for standard conditions.
2. Table 3-2 classifies severity of service as "Severe".
3. Table 3-4 shows that 1.2 in^3 or 3.9 teaspoon of grease is to be added.

Note: Smaller bearings in size category may require reduced amounts of grease.

Table 3-5 Troubleshooting Chart

Symptom	Possible Causes	Possible Solutions
Motor will not start	Usually caused by line trouble, such as, single phasing at the starter.	Check source of power. Check overloads, fuses, controls, etc.
Excessive humming	High Voltage.	Check input line connections.
	Eccentric air gap.	Have motor serviced at local Baldor service center.
Motor Over Heating	Overload. Compare actual amps (measured) with nameplate rating.	Locate and remove source of excessive friction in motor or load. Reduce load or replace with motor of greater capacity.
	Single Phasing.	Check current at all phases (should be approximately equal) to isolate and correct the problem.
	Improper ventilation.	Check external cooling fan to be sure air is moving properly across cooling fins. Excessive dirt build-up on motor. Clean motor.
	Unbalanced voltage.	Check voltage at all phases (should be approximately equal) to isolate and correct the problem.
	Rotor rubbing on stator.	Check air gap clearance and bearings.
		Tighten “Thru Bolts”.
	Over voltage or under voltage.	Check input voltage at each phase to motor.
	Open stator winding.	Check stator resistance at all three phases for balance.
	Grounded winding.	Perform dielectric test and repair as required.
	Improper connections.	Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity. Refer to motor lead connection diagram.
Bearing Over Heating	Misalignment.	Check and align motor and driven equipment.
	Excessive belt tension.	Reduce belt tension to proper point for load.
	Excessive end thrust.	Reduce the end thrust from driven machine.
	Excessive grease in bearing.	Remove grease until cavity is approximately $^3/_4$ filled.
	Insufficient grease in bearing.	Add grease until cavity is approximately $^3/_4$ filled.
	Dirt in bearing.	Clean bearing cavity and bearing. Repack with correct grease until cavity is approximately $^3/_4$ filled.
Vibration	Misalignment.	Check and align motor and driven equipment.
	Rubbing between rotating parts and stationary parts.	Isolate and eliminate cause of rubbing.
	Rotor out of balance.	Have rotor balance checked are repaired at your Baldor Service Center.
	Resonance.	Tune system or contact your Baldor Service Center for assistance.
Noise	Foreign material in air gap or ventilation openings.	Remove rotor and foreign material. Reinstall rotor. Check insulation integrity. Clean ventilation openings.
Growling or whining	Bad bearing.	Replace bearing. Clean all grease from cavity and new bearing. Repack with correct grease until cavity is approximately $^3/_4$ filled.

Suggested bearing and winding RTD setting guidelines

Most large frame AC Baldor motors with a 1.15 service factor are designed to operate below a Class B (80°C) temperature rise at rated load and are built with a Class H winding insulation system. Based on this low temperature rise, RTD (Resistance Temperature Detectors) settings for Class B rise should be used as a starting point. Some motors with 1.0 service factor have Class F temperature rise.

The following tables show the suggested alarm and trip settings for RTDs. Proper bearing and winding RTD alarm and trip settings should be selected based on these tables unless otherwise specified for specific applications.

If the driven load is found to operate well below the initial temperature settings under normal conditions, the alarm and trip settings may be reduced so that an abnormal machine load will be identified.

The temperature limits are based on the installation of the winding RTDs imbedded in the winding as specified by NEMA. Bearing RTDs should be installed so they are in contact with the outer race on ball or roller bearings or in direct contact with the sleeve bearing shell.

Winding RTDs – Temperature Limit In °C (40°C Maximum Ambient)

Motor Load	Class B Temp Rise ≤ 80°C (Typical Design)		Class F Temp Rise ≤ 105°C		Class H Temp Rise ≤ 125°C	
	Alarm	Trip	Alarm	Trip	Alarm	Trip
≤ Rated Load	130	140	155	165	175	185
Rated Load to 1.15 S.F.	140	150	160	165	180	185

Note: • Winding RTDs are factory production installed, not from Mod–Express.
• When Class H temperatures are used, consider bearing temperatures and relubrication requirements.

Bearing RTDs – Temperature Limit In °C (40°C Maximum Ambient)

Bearing Type Oil or Grease	Anti–Friction		Sleeve	
	Alarm	Trip	Alarm	Trip
Standard*	95	100	85	95
High Temperature**	110	115	105	110

Note: * Bearing temperature limits are for standard design motors operating at Class B temperature rise.
** High temperature lubricants include some special synthetic oils and greases.

Greases that may be substituted that are compatible with Polyrex EM (but considered as “standard” lubricants) include the following:

- Texaco Polystar
- Rykon Premium #2
- Chevron SRI #2
- Mobilith SHC–100
- Pennzoil Pennzlube EM–2
- Chevron Black Pearl
- Darmex 707
- Darmex 711
- Petro–Canada Peerless LLG

See the motor nameplate for replacement grease or oil recommendation.
Contact Baldor application engineering for special lubricants or further clarifications.

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TIGEAR–2 REDUCERS

DODGE®

BALDOR®

Engineering That Raises The Bar

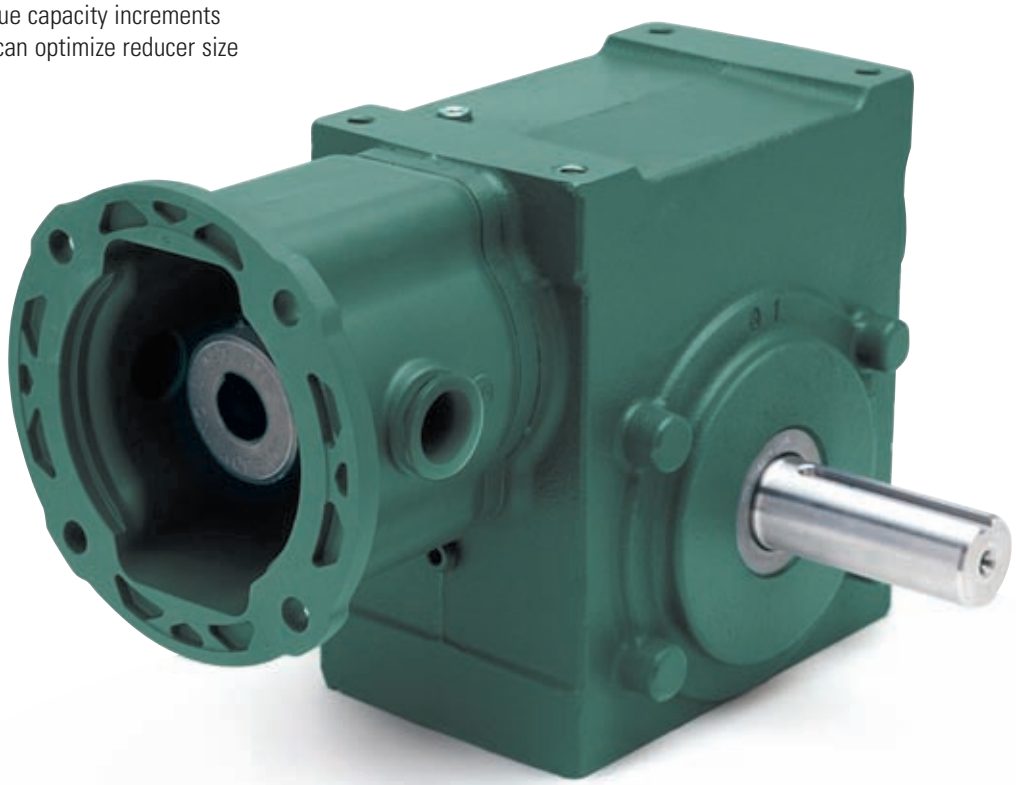
Never before have greater advancements been made in speed reducer technology.

TIGEAR-2 is the only complete line of single-reduction, right-angle worm speed reducers specifically engineered with advanced sealing and bushing system technology that can actually lower your total cost of ownership.

TIGEAR-2 is offered in 10 sizes covering center distances from 1.33" to 4.75". It has a 30% increase on average output torque (up to 6,800 in-lbs.), and because of the consistent torque capacity increments between case sizes, equipment designers can optimize reducer size selections for cost, performance, and life.

The DODGE TIGEAR-2 reducer design has a totally enclosed, ventless sealing system that contains a factory-filled synthetic lubricant that actually runs cooler, as well as eliminates the need for routine oil changes. Its precision-manufactured gear geometry balances multiple gear parameters for dramatic improvements in torque capacity, efficiency, and operating temperatures. TIGEAR-2 is the only worm reducer with the GRIP TIGHT® tapered bushing system.

All combined, TIGEAR-2 raises the bar, offering you innovation and manufacturing expertise that is unmatched in the industry.



TIGEAR–2 Sealing System Operates Effectively With No Pressure Vent, No Compression Chamber

Custom-Formulated HNBR Wave Seal

Hydrogenated Nitrile Butadiene Rubber (HNBR) material has been proven to be a better all-round choice for oil compatibility, wear, and temperature range. Overall, it provides six times the wear resistance of industry-standard nitrile seals.

Special Hydrodynamic Wave Seal Design

The special wave shape (molded into the seal lip) generates a better hydrodynamic film, which is required between the seal and the shaft for long life. This special wave design generates less drag, less heat, and virtually eliminates shaft grooving created by the single-point wear track, which is common with conventional trimmed lip seal designs. The sinusoidal lip of the wave seal effectively pushes external contaminants away and pumps lubricant back into the oil sump.

Special Lip Construction

Optimized lip-to-shaft static contact pressures ensure maximum life. In addition, special sealing elements operate under pressure without detrimental effect on service life or sealing performance.

Factory-Filled Synthetic Lubricant

The standard synthetic lubricant used in TIGEAR-2 meets H1 food grade requirements and accommodates a wide range of operating temperatures. In extensive laboratory tests, it lowered operating temperatures by 20° F over other popular synthetics. No routine scheduled oil changes are required.

Shaft System Element

Unique low-speed shaft design minimizes concentrations of stress, thereby increasing the overhung load capacity. Its surface finish and hardness characteristics contribute to reduce seal wear and increase life.

Configuration Options

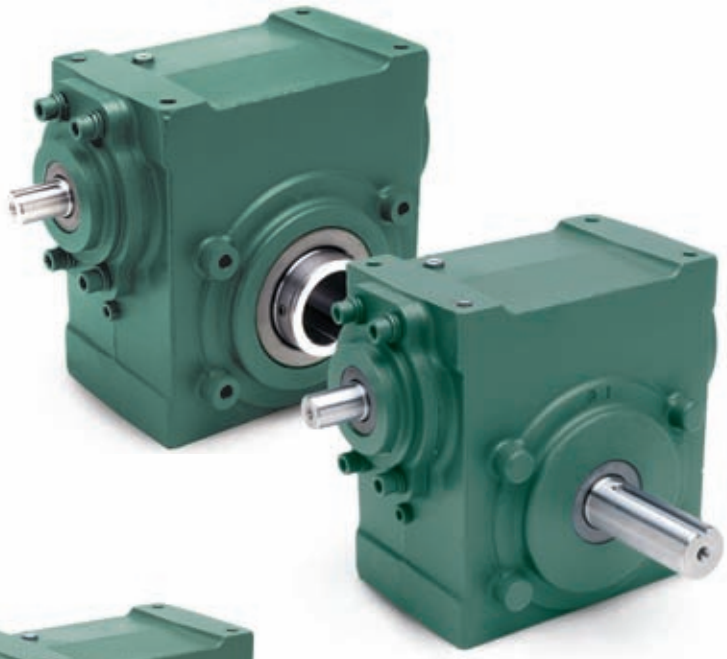
The advanced design concept of the TIGEAR-2 reducer product line provides extreme flexibility for applications that require from 100 to more than 6,500 lb-in of torque. Whether the application requires the compactness of a quill-style input, the durability of a three-piece coupled input, or a separate keyed input shaft for belt-driven equipment, TIGEAR-2 is the answer. With six basic reducer configurations and stock bolt-on accessories, the TIGEAR-2 reducer line is truly a complete line that is full of value.

Quill Input

Space-saving quill-style input reducers for NEMA C-face motors in both solid and hollow output designs

Separate Input

Separate style input reducers with solid or hollow output shafts are suitable for either belted or direct-coupled motor connections

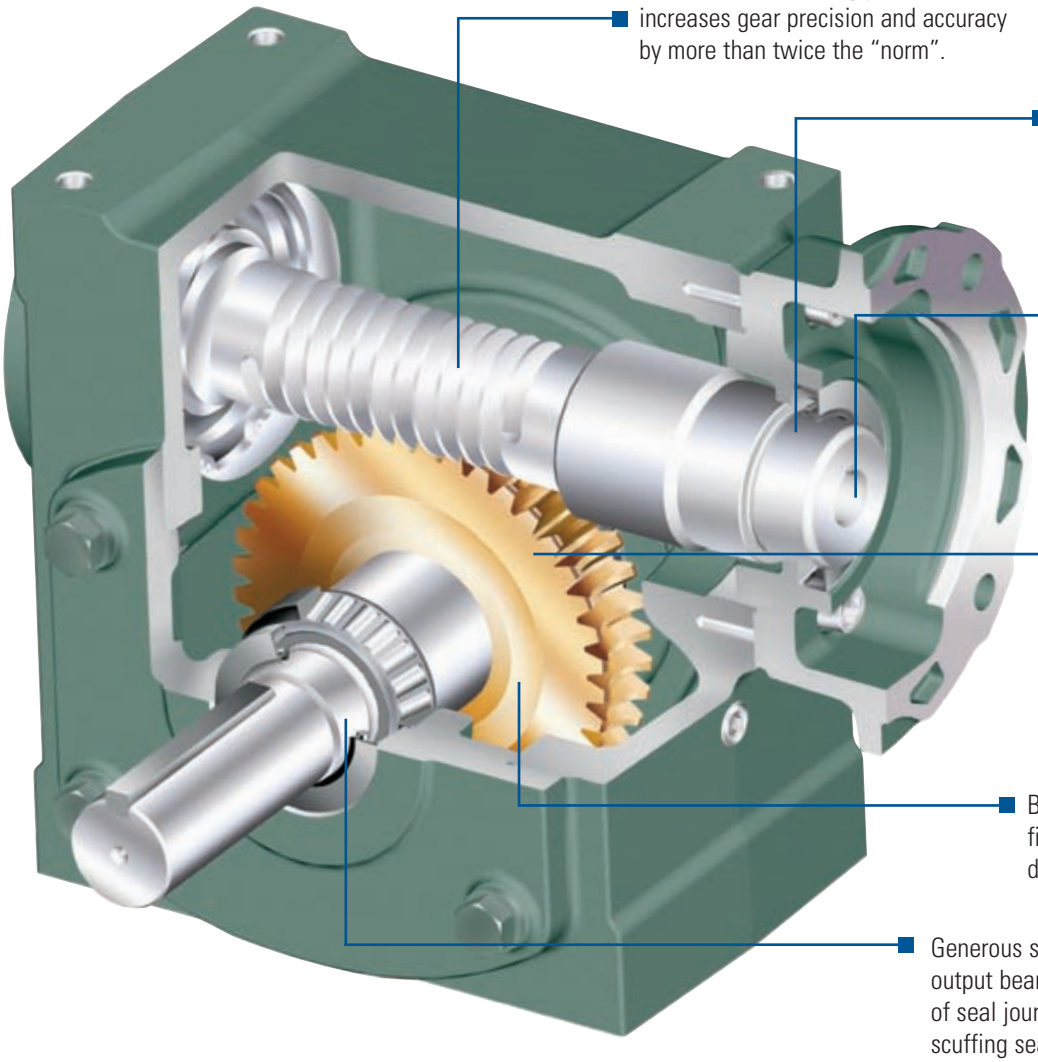


3-Piece Coupled Input

Attaching a stock, 3-piece coupled motor adapter kit to a separate style reducer creates a durable drive package that facilitates easy motor removal and provides protection against shock loads and other unpredictable vibrations.

Maintenance-Free Design

- On average, the gear geometry delivers 30% more torque than competitive, same-sized models. Permits downsizing and helps reduce total cost of ownership.
- TIGEAR-2 reducers are dimensionally interchangeable with most original TIGEAR reducers, as well as many competitive models.



Worm shaft machining process increases gear precision and accuracy by more than twice the "norm".

Seal journals are held to exacting tolerances for diameter and surface finish (8 - 17 Ra). Precise plunge grinding process eliminates invisible lead and assures cool-running, long-life seals.

Unique internal design of input quill, along with a special factory-applied anti-seize compound, helps to reduce chances for fretting corrosion with motor shaft.

State-of-the-art computer modeling and optimization of multiple gear parameters in TIGEAR-2 gear geometry allow higher torque capacity, greater efficiency, and cooler operating temperatures. End result: long life and lower operating costs for user.

Bronze gear material has an extremely fine grain structure for maximum durability and minimum wear.

Generous step between diameter of output bearing journal and diameter of seal journal prevents bearing from scuffing seal journal during assembly.

Washdown Applications

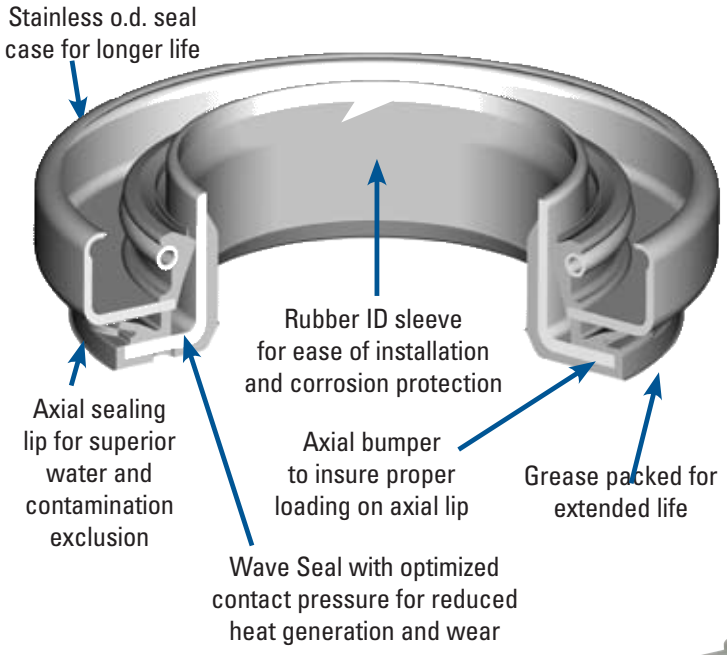
E-Z KLEEN and ULTRA KLEEN reducers are the best choice for food and beverage industries.

For maximum washdown protection, E-Z KLEEN and ULTRA KLEEN reducers include premium features the competition doesn't offer.

E-Z KLEEN reducers are manufactured with a 13-step coating system that provides more than three times the corrosion resistance of standard epoxy-painted units. For "paint free" specifications, ULTRA KLEEN stainless steel reducers provide ultimate washdown protection.

And, to ensure that their interior is as protected as their exterior, E-Z KLEEN and ULTRA KLEEN reducers have a two-piece, harsh-duty sealing system that protects against high-pressure sprays and sanitizing solutions. The totally enclosed ventless sealing system contains a factory filled H1 Food Grade synthetic lubricant that eliminates the need for routine oil changes.

XT Harsh Duty Seal


Stainless o.d. seal case for longer life
Rubber ID sleeve for ease of installation and corrosion protection
Axial sealing lip for superior water and contamination exclusion
Axial bumper to insure proper loading on axial lip
Grease packed for extended life
Wave Seal with optimized contact pressure for reduced heat generation and wear

E-Z KLEEN STANDARD FEATURES

- A 13-step coating system
- Stainless color top coat – White finish also available
- 300 series Stainless Steel solid and hollow output shafts and stainless hardware
- Two-piece harsh duty output seals
- Factory filled H1 food grade synthetic lubrication
- Offered in sizes 13 through 35 in Quill and 3-Piece Coupled input with solid or hollow output configurations

E-Z KLEEN ACCESSORIES

- Stainless steel Straight Bore bushings
- Stainless steel GRIP TIGHT® bushings (as available)
- E-Z KLEEN bolt-on base kit
- E-Z KLEEN riser block kit
- E-Z KLEEN J-mount kit
- E-Z KLEEN output flange kit

ULTRA KLEEN STANDARD FEATURES

- Premium 316 stainless steel housings
- Available in solid and hollow output shafts
- 300 series Stainless Steel solid and hollow output shafts and stainless hardware
- Two-piece harsh duty output seals
- Factory filled H1 food grade synthetic lubrication
- Input/Output Configurations:
  - Quill input and solid or hollow output configurations in sizes 17, 21, 23, 26 and 30
  - 3-piece coupled input available in sizes 17, 23, and 30

ULTRA KLEEN ACCESSORIES

- Stainless-steel Straight Bore bushings
- Stainless steel GRIP TIGHT® bushings (as available)
- Stainless steel bolt-on base kit
- Stainless steel output flange kit

Grip Tight Tapered Bushing System

Locking System

The GRIP TIGHT® tapered bushing system in TIGEAR-2 uses concepts that have proven to be effective in the locking mechanism of the DODGE IMPERIAL™ bearing to simplify installation and removal and prevent fretting corrosion problems. There are no loose fasteners to misplace during installation, and the locking nut creates a positive means for easy removal.

Minimum Shaft Length

The system's tapered bushings allow for mounting in some of the tightest places on almost any size shaft. (Driven shafts need not protrude completely through the reducer bore.)

Bushing Options

When used in pairs, the tapered bushings can be used without output keys. Stainless options are available for severe washdown applications.

Easy Bushing Installation

Slide bushing and reducer onto shaft.

Tighten locking nut by hand to remove clearances.

Complete locking procedure with hammer and drift

Additional Optional Accessories

- Bolt-on base kit
- Riser block kit
- J-mount base kit
- Output flange kit
- Tie rod kit
- Tapered bushing kit
- Straight bore bushing kit
- Output bracket kit
- Plug-in output shaft kit
- Special paint options for washdown applications
- Low temperature lubrication
- Output shaft reversal kit
- Hollow output safety covers

TIGEAR–2 Helical Attachment

A double NEMA 56 and 140 C-face helical gear attachment for TIGEAR-2 reducers expands the ratio range from 75:1 to 300:1 The helical attachment has a quill input coupling for quick and easy motor attachment. It easily attaches to a TIGEAR-2 reducer with 56C and 140TC quill or 3-piece coupled input.

- Available with NEMA 56 and 140 C-face input and output
- Available in 4:1 and 5:1 ratios
- Factory filled with food grade synthetic lubricant
- Lubed for life
- No breather
- Suitable for all mounting positions right out of the box
- Cast iron construction

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BR1611
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GEARING

DODGE® TIGEAR-2® Helical Attachment

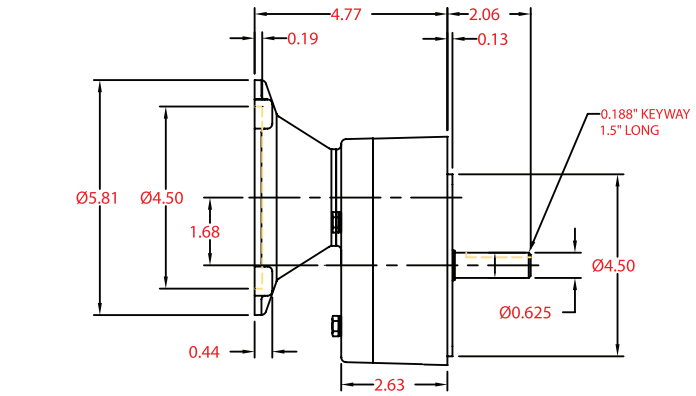
A new, double NEMA 56 C-face and 140 C-face helical gear attachment is now available for TIGEAR-2 reducers, providing gear ratios from 75:1 to 300:1.

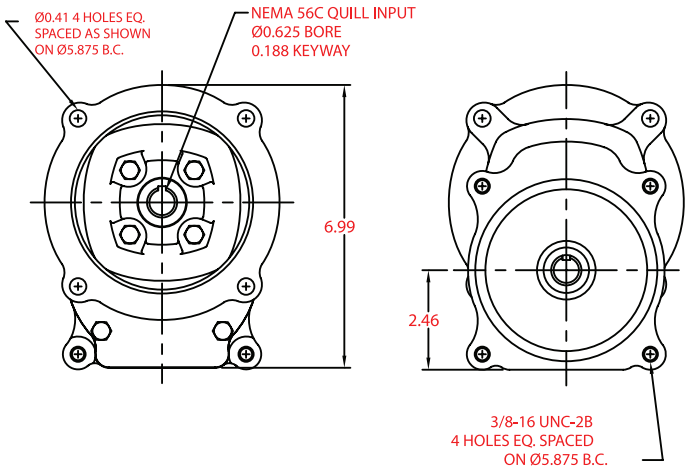
The new helical attachment has a quill input coupling for quick and easy motor attachment. It easily attaches to a TIGEAR-2 reducer with 56C quill and 140TC quill or 3-piece coupled input.

- Available with NEMA 56 C-face and 140 C-face input and output
- Available in 4:1 and 5:1 ratios
- Factory filled with food grade synthetic lubricant
- Lubed for life
- No breather
- Suitable for all mounting positions right out of the box
- Cast iron construction

With the helical attachment, customers can now take advantage of all the TIGEAR-2 features with available ratios up to 300:1.

Size 1





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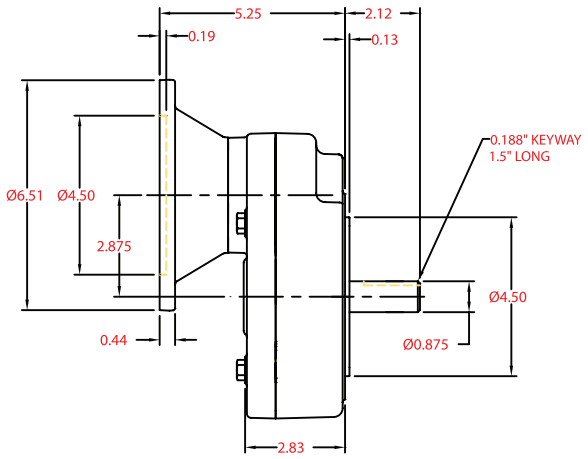

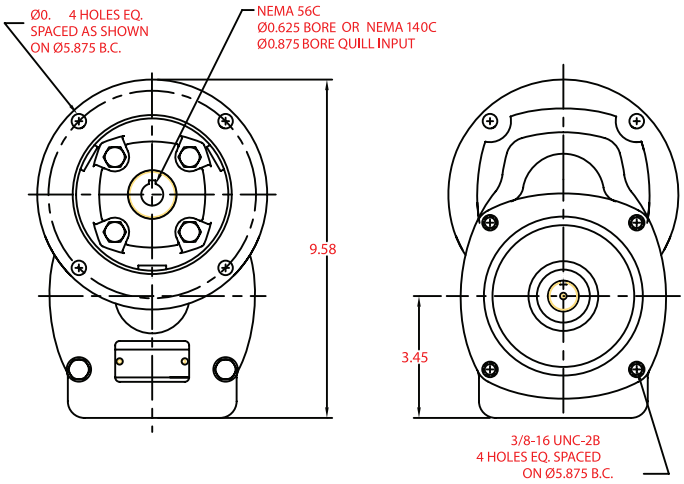

TIGEAR-2 Helical Attachment

Size	Ratio	HA Part Number	Input RPM	Output RPM	Input HP	Output HP	Output Torque (lb.in.)	Output OHL (lbs.)	Input Style	Output Style
1	4	156HA456	1750	438	0.5	0.49	71	224	56C	56C
1	5	156HA556	1750	350	0.5	0.49	88	247	56C	56C
2	4	256HA414	1750	438	1.5	1.47	212	445	56C	140C
2	5	256HA514	1750	350	1.5	1.47	265	360	56C	140C
2	4	214HA414	1750	438	1.5	1.47	212	445	140C	140C
2	5	214HA514	1750	350	1.5	1.47	265	360	140C	140C

TIGEAR-2 Helical Attachment

Quick Selections: Helical Attachment and TIGEAR-2 Assemblies

Overall Ratio	Output RPM	Motor HP	O/P Torque	SF	HA Part Number	TIGEAR-2 Part Number			
						Solid Shaft Left	Solid Shaft Right	Solid Shaft Left/Right	Hollow Shaft
75	23.33	0.25	546	1.17	156HA556	17Q15L56	17Q15R56	17Q15R56	17Q15H56
		0.33	729	1.30	156HA556	20Q15L56	20Q15R56	20Q15R56	20Q15H56
		0.5	1105	1.33	156HA556	23Q15L56	23Q15R56	23Q15R56	23Q15H56
		0.75	1676	1.31	256HA514	26Q15L14	26Q15R14	26Q15R14	26Q15H14
		1.0	2235	1.43	256HA514	30Q15L14	30Q15R14	30Q15R14	30Q15H14
		1.5	3353	1.55	256HA514	35Q15L14	35Q15R14	35Q15R14	35Q15H14
80	21.88	0.25	556	1.19	156HA456	17Q20L56	17Q20R56	17Q20R56	17Q20H56
		0.33	742	1.32	156HA456	20Q20L56	20Q20R56	20Q20R56	20Q20H56
		0.5	1139	1.34	156HA456	23Q20L56	23Q20R56	23Q20R56	23Q20H56
		0.75	1728	1.32	256HA414	26Q20L14	26Q20R14	26Q20R14	26Q20H14
		1.0	2305	1.55	256HA414	30Q20L14	30Q20R14	30Q20R14	30Q20H14
		1.5	3457	1.55	214HA414	35Q20L14	35Q20R14	35Q20R14	35Q20H14
100	17.5	0.25	736	1.29	156HA556	20Q20L56	20Q20R56	20Q20R56	20Q20H56
		0.33	928	1.06	156HA556	20Q20L56	20Q20R56	20Q20R56	23Q20H56
		0.5	1423	1.07	156HA556	23Q20L56	23Q20R56	23Q20R56	26Q20H56
		0.75	2161	1.05	256HA514	26Q20L14	26Q20R14	26Q20R14	30Q20H14
		1.0	2881	1.24	256HA514	30Q20L14	30Q20R14	30Q20R14	35Q20H14
		1.5	4321	1.24	214HA514	35Q20L14	35Q20R14	35Q20R14	47Q20H14
120	14.58	0.25	782	1.24	156HA456	20Q30L56	20Q30R56	20Q30R56	20Q30H56
		0.33	1046	1.44	156HA456	23Q30L56	23Q30R56	23Q30R56	23Q30H56
		0.5	1605	1.41	156HA456	26Q30L56	26Q30R56	26Q30R56	26Q30H56
		0.75	2408	1.33	256HA414	30Q30L14	30Q30R14	30Q30R14	30Q30H14
		1.0	3211	1.66	256HA414	35Q30L14	35Q30R14	35Q30R14	35Q30H14
		1.5	4816	1.11	214HA414	35Q30H14	35Q30H14	35Q30H14	35Q30H14
125	14.00	0.25	836	1.19	156HA556	20Q25L56	20Q25R56	20Q25R56	20Q25H56
		0.33	1104	1.40	156HA556	23Q25L56	23Q25R56	23Q25R56	23Q25H56
		0.5	1715	1.35	156HA556	26Q25L56	26Q25R56	26Q25R56	26Q25H56
		0.75	2572	1.28	256HA514	30Q25L14	30Q25R14	30Q25R14	30Q25H14
		1.0	3430	1.57	256HA514	35Q25L14	35Q25R14	35Q25R14	35Q25H14
		1.5	5145	1.46	214HA514	40Q25H14	40Q25H14	40Q25H14	40Q25H14
150	11.67	0.25	990	1.52	156HA556	23Q30L56	23Q30R56	23Q30R56	23Q30H56
		0.33	1307	1.15	156HA556	23Q30L56	23Q30R56	23Q30R56	23Q30H56
		0.5	2007	1.13	156HA556	26Q30L56	26Q30R56	26Q30R56	26Q30H56
		0.75	3010	1.06	256HA514	30Q30L14	30Q30R14	30Q30R14	30Q30H14
		1.0	4013	1.33	256HA514	35Q30L14	35Q30R14	35Q30R14	35Q30H14
		1.5	6020	1.25	214HA514	40Q30H14	40Q30H14	40Q30H14	40Q30H14
160	10.94	0.25	976	1.55	156HA456	23Q40L56	23Q40R56	23Q40R56	23Q40H56
		0.33	1288	1.17	156HA456	23Q40L56	23Q40R56	23Q40R56	23Q40H56
		0.5	2006	1.13	156HA456	26Q40L56	26Q40R56	26Q40R56	26Q40H56
		0.75	3009	1.18	256HA414	30Q40L14	30Q40R14	30Q40R14	30Q40H14
		1.0	4013	1.33	256HA414	35Q40L14	35Q40R14	35Q40R14	35Q40H14
		1.5	6019	1.25	214HA414	40Q40H14	40Q40H14	40Q40H14	40Q40H14
200	8.75	0.25	1220	1.24	156HA556	23Q40L56	23Q40R56	23Q40R56	23Q40H56
		0.33	1655	1.37	156HA556	26Q40L56	26Q40R56	26Q40R56	26Q40H56
		0.5	2508	1.41	156HA556	30Q40L56	30Q40R56	30Q40R56	30Q40H56
		0.75	3762	1.42	256HA514	35Q40L14	35Q40R14	35Q40R14	35Q40H14
		1.0	5016	1.06	256HA514	35Q40L14	35Q40R14	35Q40R14	35Q40H14
240	7.29	0.25	1260	1.11	156HA456	23Q60L56	23Q60R56	23Q60R56	23Q60H56
		0.33	1718	1.21	156HA456	26Q60L56	26Q60R56	26Q60R56	26Q60H56
		0.5	2603	1.09	156HA456	30Q60L56	30Q60R56	30Q60R56	30Q60H56
		0.75	3904	1.22	256HA414	35Q60L14	35Q60R14	35Q60R14	35Q60H14
		1.0	5206	1.28	256HA414	40Q60L14	40Q60R14	40Q60R14	40Q60H14
250	7.00	0.25	1439	1.53	156HA556	26Q50L56	26Q50R56	26Q50R56	26Q50H56
		0.33	1900	1.16	156HA556	26Q50L56	26Q50R56	26Q50R56	26Q50H56
		0.5	2878	1.14	156HA556	30Q50L56	30Q50R56	30Q50R56	30Q50H56
		0.75	4317	1.19	256HA414	35Q50L14	35Q50R14	35Q50R14	35Q50H14
		1.0	5756	1.25	256HA414	40Q50L14	40Q50R14	40Q50R14	40Q50H14
300	5.83	0.25	1627	1.28	156HA556	26Q60L56	26Q60R56	26Q60R56	26Q60H56
		0.33	2147	1.32	156HA556	30Q60L56	30Q60R56	30Q60R56	30Q60H56
		0.5	3254	1.46	156HA556	35Q60L56	35Q60R56	35Q60R56	35Q60H56
		0.75	4881	1.36	256HA514	40Q60L14	40Q60R14	40Q60R14	40Q60H14

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DODGE® TIGEAR-2™ Right Angle Quill C-Face, 3-Piece Coupled C-Face, & Separate Speed Reducers

Mounting, Operation and Maintenance Instructions
Sizes 13 - 47

These instructions must be read thoroughly before installing or operating this product.

APPLICATION INFORMATION

Thoroughly review the selection section of the Baldor•Dodge Tigear-2 catalog to ensure the reducer has been properly selected before putting the product into service.

The Tigear-2 reducer is designed to operate within the following temperature limits: Oil sump -10°F to +200°F with factory supplied standard lubricant.

The oil sump temperature can be approximated by taking measurements on the gear case upper or lower mounting pads on the end of the reducer opposite of the motor.

Where ambient temperatures exceed 100°F, care should be taken not to exceed 200°F sump temperature during unit operation. Contact Baldor•Dodge Engineering for application assistance in extreme hot or cold ambient conditions. The use of non-ventilated motors will increase the reducer temperature. TEFC motors are recommended.

The continuous rated input horsepower (mechanical) shown on the reducer nameplate is for service factor of 1.0 at an input speed of 1750 RPM. Before placing the reducer into service, check the nameplate to confirm that its horsepower rating is consistent with the motor horsepower and the desired service factor. Service factor information can be found in your Baldor•Dodge Engineering catalogs.

3-piece coupled input reducers are required when using a clutch or clutch-brake between the reducer and motor. 3-piece coupled is also recommended when using single phase motors, or motors with brakes.

WARNING: Because of the possible danger to person(s) or property from accidents which may result from the improper use of products, it is important that correct procedures be followed. Products must be used in accordance with the engineering information specified in the catalog. Proper installation, maintenance and operation procedures must be observed. The instructions in the instruction manuals must be followed. Inspections should be made as necessary to assure safe operation under prevailing conditions. Proper guards and other suitable safety devices or procedures, as may be desirable, or as may be specified in safety codes should be provided, and are neither provided by Baldor Electric Company, nor are the responsibility of Baldor Electric Company. This unit and its associated equipment must be installed, adjusted and maintained by qualified personnel who are familiar with the construction and operation of all equipment in the system and the potential hazards involved. When risks to persons or property may be involved, a holding device must be an integral part of the driven equipment beyond the speed reducer output shaft.

INITIAL START-UP

WARNING: To ensure that driven equipment is not unexpectedly started, turn off, lock out and tag power source before working near the equipment. Failure to observe these precautions could result in bodily injury or property damage.

The TIGEAR-2 reducer will require a break-in period before reaching maximum operating efficiency and may run hot during the initial operation of the reducer. This is normal. It is also possible for a few drops of oil to be purged from the lip seals during the break-in period. The user can recognize this start-up seepage by its small volume and short duration. New reducers should be checked periodically during the first few days of use for any signs of severe overheating, continuous lubricant leakage or unusual noises.

CHECKLIST

1. Visually inspect the contents of the shipping container for any damage that may have been caused during shipping. Check contents for missing hardware and accessories.
2. Quill style input reducers are shipped from the factory as follows:
   a) Input key installed in the Quill bore. DO NOT REMOVE THIS KEY AND SUBSTITUTE ANY OTHER KEY.
   b) Quill bore is pre-lubricated with special anti-seize compound – (do not remove).
   c) (4) motor mounting bolts with lock washers in a plastic bag.
   d) Output key is taped to the output (slow speed) shaft.
   e) With hollow output reducers. The output key is supplied along with (6) set screws that have been pre-installed in the output (slow speed) hub.
   f) Motor mounting flange gasket.
3. Separate style input reducers (keyed input shaft) are shipped from the factory as follows:
   a) Input key taped to input shaft.
   b) Output key taped to output (slow speed) shaft.
   c) With hollow output reducers. The output key is supplied along with (6) set screws that have been pre-installed in the output (slow speed) hub.
4. Motor Adapter Kits (Three-piece coupled)
   a) Reducer coupling hub
   b) Motor coupling hub
   c) Elastomeric element
   d) Motor adapter
   e) Adapter mounting hardware
   f) (4) motor mounting bolts with lock washers in a plastic bag
   g) “O” ring for adapter to reducer
   h) Motor mounting flange gasket

MAINTENANCE

TIGEAR-2 reducers require no periodic maintenance. However, an occasional visual inspection to check for hardware tightness, leakage and the general overall condition of the reducer is good practice. TIGEAR-2 reducers are designed to operate successfully without breather vents. Since the reducer is shipped with lubricant, and breather plugs are not required, the user is able to eliminate the lengthy preparation normally required to place a reducer into service.

LUBRICATION – OIL FILL LEVELS

The TIGEAR-2 reducer is factory filled with a synthetic lubricant which eliminates costly preparation time normally required to put a reducer into service. The lubricant supplied is a high performance, H1 grade lubricant, suitable for all approved mounting positions. Do not add or remove any oil during installation or after the break-in period. When reducer selections are properly service factored to account for the thermal limitations of the reducer, the standard lubricant covers an operating ambient temperature range of -10°F to 130°F. No other lubricant available on the market provides the outstanding wear protection and thermal abilities of the factory-filled lubricant. Other lubricants, including Mobil SHC series lubricant, must not be mixed with the factory supplied lubricant. The use of another lubricant may compromise the performance of the reducer and void the warranty. Baldor•Dodge replacement lubricant is available through Baldor•Dodge Renewal Parts, 864-297-4160. Standard temperature range replacement lubricant is available in quarts, part number 334863, and gallons, part number 334862. For operating ambient temperature range from -10°F to -30°F, replace the factory supplied lubricant with low temperature lubricant. Low temperature lubricant is available in quarts, part number 334861, and gallons, part number 334860.

CONFIGURATION	REDUCER SIZE									
	13	15	17	20	23	26	30	35	40	47
Quill Input Hollow Output Shaft	6 oz.	7 oz.	11 oz.	14 oz.	21 oz.	28 oz.	44 oz.	60 oz.	89 oz.	164 oz.
Quill Input Solid Shaft Output	6 oz.	7 oz.	12 oz.	15 oz.	23 oz.	32 oz.	48 oz.	66 oz.	97 oz.	176 oz.
Separate or 3-Piece Coupled Input Hollow Output Shaft	9 oz.	10 oz.	15 oz.	21 oz.	28 oz.	38 oz.	59 oz.	82 oz.	139 oz.	228 oz.
Separate or 3-Piece Coupled Input Solid Output Shaft	9 oz.	11 oz.	18 oz.	23 oz.	32 oz.	44 oz.	70 oz.	94 oz.	144 oz.	266 oz.

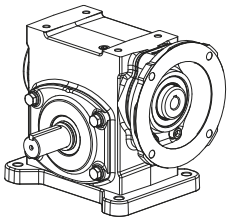
THE TIGEAR-2 SEALING SYSTEM

TIGEAR-2 reducers are kept completely sealed from the environment. No breather vents are required for any approved mounting position. The special design of the gear sets and the special synthetic lubricant enable the reducer to operate in a highly efficient manner. The internal temperature rise is minimized which, in turn, minimizes internal pressure build up. TIGEAR-2 oil seals employ special lip material and fit and are designed to ensure long, leak free operation when subjected to the small amounts of pressure that may develop within the speed reducer.

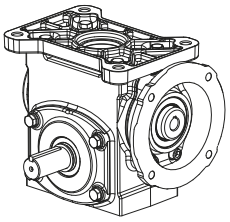
WARNING: The gearcase may be under pressure when the oil sump temperature is higher than the ambient temperature. Allow the reducer to cool down to room temperature before removing seals or bearing covers. Slightly loosen oil fill plug on top of gear case to vent any internal pressure. Failure to observe this precaution could result in personal injury or damage to the equipment.

MOUNTING POSITIONS

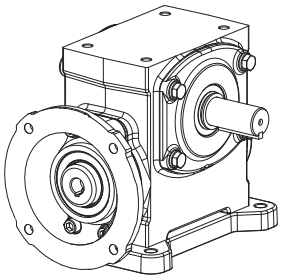
TIGEAR-2 reducers are supplied with a high performance lubricant factory filled to a level suitable for all approved mounting positions. Contact Baldor•Dodge Application Engineering for positions not shown.



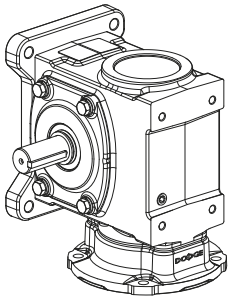
Floor Mounted, Motor Adapter or Input Shaft above Output Shaft



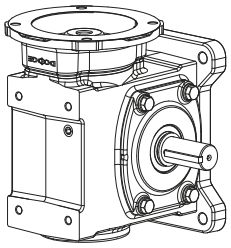
Ceiling Mounted, Motor Adapter or Input Shaft above the Output Shaft



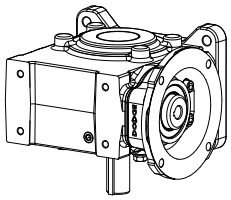
Floor or Ceiling Mounted, Motor Adapter or Input Shaft below Output Shaft
See Note 1



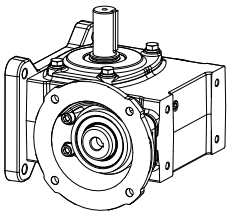
Wall Mounted, Motor Adapter or Input Shaft Facing Down
See Note 2



Wall Mounted, Motor Adapter or Input Shaft Facing Up
See Note 3



Wall Mounted, Output Shaft Facing Down
See Note 4



Wall Mounted, Output Shaft Facing Up
See Note 4

Note 1: Not recommended due to flooded input seal.

Note 2: Not recommended due to flooded input seal. The configuration does not allow the upper bearing to get sufficient lubrication.

Note 3: Not recommended for 3-piece coupled input. The configuration does not allow the upper bearing to get sufficient lubrication.

Note 4: Not recommended for Quill input.

Motor Mounting Instructions - Quill Style Reducers

1. Check the reducer C-face mounting surface and tenon for nicks, burrs, and cleanliness.
2. Locate the supplied motor mounting bolts and lock washers shipped with the reducer.
3. Verify the factory applied anti-seize compound is in the quill bore. Do not remove the anti-seize compound from the bore.
4. Check that the factory installed quill input key is in place. The key may not be flush with the end of the input quill shaft.

WARNING: Do not replace the pre-installed key with any other key, or add an additional key. Failure to use the factory supplied key may result in motor shaft and quill bore damage along with the inability to transmit torque.

5. Check the motor shaft, motor shaft keyway, and motor C-face mounting surface for nicks, burrs, cleanliness and proper size.
6. Be sure to install the supplied gasket between the motor and reducer C-face mounting surfaces.
7. Place the reducer on a secure surface with the reducer C-face mounting surface facing up. Align the quill input key with the motor shaft keyway and lower the motor into place making sure the motor tenon fully seats in the reducer motor adapter. If the motor cannot be installed vertically, the use of 2 threaded studs during the assembly will help locate and align the motor as it is being mounted onto the reducer. Thread the studs into any 2 tapped holes in the motor C-face that are 180 degrees apart as shown in Figure 2. Align the reducer key and motor keyway, and also align the threaded studs with the mounting holes in the reducer C-face. Slide the motor into place making sure the motor tenon fully seats in the reducer motor adapter.
8. Install and tighten the motor bolts to the values shown below.

Size Bolt	Torque in-lbs. (non-lubricated)
3/8	250-375
1/2	650-975

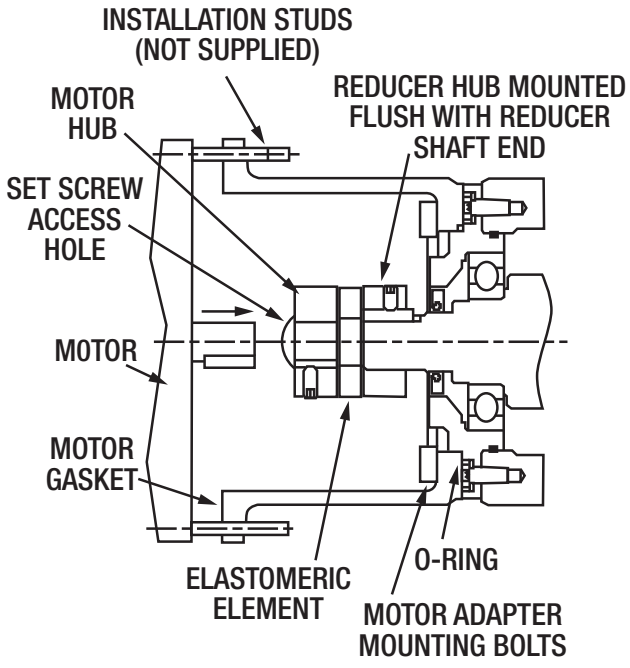
MOTOR MOUNTING INSTRUCTIONS – Separate Style Reducer with 3-Piece Coupling Motor Adapter

This configuration of Tigear-2 uses a standard NEMA C-Face motor with a 3-piece flexible coupling.

ASSEMBLING THE COUPLING

1. Position the reducer vertically with the input shaft facing up.
2. Install reducer half of the coupling with key so that the main body of the hub is flush with the end of the reducer input shaft and tighten the set-screw.
3. Install the supplied “O” ring between the reducer and the motor adapter.
4. Install the Motor Adapter using the supplied hardware.
5. Install the elastomeric center element of the coupling.
6. Place the motor half of the coupling onto the elastomeric element mounted on the reducer shaft.
7. Install the key into the motor shaft. Stake in place with a punch.
8. Install the gasket between the motor and motor adapter flange.
9. Align the coupling keyway and motor key then slide the motor shaft into the coupling assembly until the motor stops against the flange.
10. Tighten the motor bolts.
11. Looking through the access hole verify that the coupling faces are in full contact with the coupling elastomeric element - without any preload.
12. Insert a .010” to .030” shim between the elastomeric element and motor half of the coupling and tighten the set screw on the motor half of the coupling.

*Contact the TIGEAR-2 Customer Order Engineering group at (864) 284-5700 with any questions.



LIMITED WARRANTY

The Baldor•Dodge TIGEAR-2 Reducer is warranted under the Dodge “Standard Terms and Conditions of Sale” against defects in material and workmanship. Warranty claims must be submitted to the company within one (1) year from the date of installation or three (3) years from the date of manufacture, whichever occurs first. The warranty is valid providing the product is properly applied, installed, operated and maintained in accordance with the instruction manual. This warranty covers product replacement or repair only and excludes labor, equipment and/or downtime for removal and installation. This warranty shall not apply where equipment is operated above rated load capacity or is subject to accident, alteration, misuse or abuse. This warranty described in the Dodge “Standard Terms and Conditions of Sale” is in lieu of and excludes all other expressed or implied warranties.

NOTE: Service and repair under warranty should be performed only by a Dodge authorized service shop. Contact Baldor Electric Company Power Systems Warranty Administration at (864) 284-5777 for the nearest location and to register warranty claims.

BALDOR®

World Headquarters

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Dodge Product Support

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DODGE®
ENDORSED LUBRICANTS

LUBRICANTS

For DODGE TIGEAR-2 Reducers

The DODGE TIGEAR-2 reducer is factory filled with a new synthetic lubricant which eliminates costly preparation time normally required to put a reducer into service. The lubricant supplied is a high performance, H1 food grade lubricant, suitable for all mounting positions. When reducer selections are properly service factored to account for the thermal limitations of the reducer, the standard lubricant covers an operating ambient temperature range of -10° F to 165° F. No other lubricant available on the market provides the outstanding wear protection and thermal abilities of the factory-filled lubricant. Other lubricants, including Mobil SHC series lubricants, must not be mixed with the factory supplied lubricant.

Low Temperature Applications

For operating ambient temperature ranges from -10° F to -30° F, order Low Temperature Lubricant at the time of reducer order.
The low temperature lubricant has all of the high performance features of the standard temperature lubricant, but has been modified for lower temperatures. Contact Application Engineering for temperatures below -30° F.

Standard Temperature Range		
Volume	Quart (32 oz)	Gallon (128 oz)
Part Number	334863	334862

Low Temperature Range		
Volume	Quart (32 oz)	Gallon (128 oz)
Part Number	334861	334860

DODGE ENDORSED OILS

Approximate Oil Volumes

Reducer Configuration	Reducer Size														
	13			15			17			20			23		
	Required Volume	You Need to Purchase		Required Volume	You Need to Purchase		Required Volume	You Need to Purchase		Required Volume	You Need to Purchase		Required Volume	You Need to Purchase	
		Gal	Qt		Gal	Qt		Gal	Qt		Gal	Qt		Gal	Qt
(QH) Quill Input Hollow Output Shaft	6 oz	-	1	7 oz	-	1	11 oz	-	1	14 oz	-	1	21 oz	-	1
(QS) Quill Input Solid Output Shaft	6 oz	-	1	7 oz	-	1	12 oz	-	1	15 oz	-	1	23 oz	-	1
Separate or 3-Piece Coupled Input (AH & SH) Hollow Output Shaft	9 oz	-	1	10 oz	-	1	15 oz	-	1	21 oz	-	1	28 oz	-	1
Separate or 3-Piece Coupled Input (AS & SS) Solid Output Shaft	9 oz	-	1	11 oz	-	1	18 oz	-	1	23 oz	-	1	1 qt	-	1

Reducer Configuration	Reducer Size														
	26			30			35			40			47		
	Required Volume	You Need to Purchase		Required Volume	You Need to Purchase		Required Volume	You Need to Purchase		Required Volume	You Need to Purchase		Required Volume	You Need to Purchase	
		Gal	Qt		Gal	Qt		Gal	Qt		Gal	Qt		Gal	Qt
(QH) Quill Input Hollow Output Shaft	28 oz	-	1	1.38 qt	-	2	1.88 qt	-	2	2.78 qt	-	3	1.28 gal	1	2
(QS) Quill Input Solid Output Shaft	1 qt	-	1	1.50 qt	-	2	2.06 qt	-	3	3.03 qt	1	-	1.38 gal	1	2
Separate or 3-Piece Coupled Input (AH & SH) Hollow Output Shaft	1.19 qt	-	2	1.84 qt	-	2	2.56 qt	-	3	1.09 gal	1	1	1.78 gal	2	-
Separate or 3-Piece Coupled Input (AS & SS) Solid Output Shaft	1.38 qt	-	2	2.19 qt	-	3	2.94 qt	-	3	1.13 gal	1	1	2.08 gal	2	1

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